THERMAL ARC®

300GTSW

PRO-WAVE

INVERTER ARC WELDER

Art # A-06102

Service Manual

Version No: AB **Issue Date:** June 21, 2012 **Manual No.:** 0-2515

Operating Features:

MMAW | GTAW | 300 AMP | CC | AC DC | 1 PHASE | 3 PHASE | 460 V

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This Operating Manual has been designed to instruct you on the correct use and operation of your Thermal Arc product. Your satisfaction with this product and its safe operation is our ultimate concern. Therefore please take the time to read the entire manual, especially the Safety Precautions. They will help you to avoid potential hazards that may exist when working with this product.

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WARNINGS

Read and understand this entire Manual and your employer's safety practices before installing, operating, or servicing the equipment.

While the information contained in this Manual represents the Manufacturer's best judgement, the Manufacturer assumes no liability for its use.

Pro-Wavel 300GTSW Inverter Arc Welder
Service Manual Number 0-2515 for:

208/230VAC Single-Voltage, Single-/Three-Phase	Spec Number: 10-3024
208/230/460VAC Single-/Three-Phase	Spec Number: 10-3025
380/415VAC Single-Voltage, Three-Phase	Spec Number: 10-3038

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Record the following information for Warranty purposes:

Where Purchased: _____

Purchase Date: _____

Equipment Serial #: _____

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SECTION 1:
SAFETY INSTRUCTIONS AND WARNINGS

WARNING

PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS KEEP AWAY UNTIL CONSULTING YOUR DOCTOR. DO NOT LOSE THESE INSTRUCTIONS. READ OPERATING/INSTRUCTION MANUAL BEFORE INSTALLING, OPERATING OR SERVICING THIS EQUIPMENT.

Welding products and welding processes can cause serious injury or death, or damage to other equipment or property, if the operator does not strictly observe all safety rules and take precautionary actions.

Safe practices have developed from past experience in the use of welding and cutting. These practices must be learned through study and training before using this equipment. Some of these practices apply to equipment connected to power lines; other practices apply to engine driven equipment. Anyone not having extensive training in welding and cutting practices should not attempt to weld.

Safe practices are outlined in the American National Standard Z49.1 entitled: SAFETY IN WELDING AND CUTTING. This publication and other guides to what you should learn before operating this equipment are listed at the end of these safety precautions. **HAVE ALL INSTALLATION, OPERATION, MAINTENANCE, AND REPAIR WORK PERFORMED ONLY BY QUALIFIED PEOPLE.**

1.01 Arc Welding Hazards

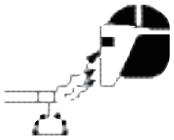
WARNING

ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also live when power is on. In semiautomatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

1. Do not touch live electrical parts.
2. Wear dry, hole-free insulating gloves and body protection.
3. Insulate yourself from work and ground using dry insulating mats or covers.
4. Disconnect input power or stop engine before installing or servicing this equipment. Lock input power disconnect switch open, or remove line fuses so power cannot be turned on accidentally.
5. Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.
6. Turn off all equipment when not in use. Disconnect power to equipment if it will be left unattended or out of service.
7. Use fully insulated electrode holders. Never dip holder in water to cool it or lay it down on the ground or the work surface. Do not touch holders connected to two welding machines at the same time or touch other people with the holder or electrode.
8. Do not use worn, damaged, undersized, or poorly spliced cables.
9. Do not wrap cables around your body.
10. Ground the workpiece to a good electrical (earth) ground.
11. Do not touch electrode while in contact with the work (ground) circuit.
12. Use only well-maintained equipment. Repair or replace damaged parts at once.

13. In confined spaces or damp locations, do not use a welder with AC output unless it is equipped with a voltage reducer. Use equipment with DC output.
14. Wear a safety harness to prevent falling if working above floor level.
15. Keep all panels and covers securely in place.



WARNING

ARC RAYS can burn eyes and skin; NOISE can damage hearing.

Arc rays from the welding process produce intense heat and strong ultraviolet rays that can burn eyes and skin. Noise from some processes can damage hearing.

1. Wear a welding helmet fitted with a proper shade of filter (see ANSI Z49.1 listed in Safety Standards) to protect your face and eyes when welding or watching.
2. Wear approved safety glasses. Side shields recommended.
3. Use protective screens or barriers to protect others from flash and glare; warn others not to watch the arc.
4. Wear protective clothing made from durable, flame-resistant material (wool and leather) and foot protection.
5. Use approved ear plugs or ear muffs if noise level is high.

WARNING

FUMES AND GASES can be hazardous to your health.

Welding produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.

1. Keep your head out of the fumes. Do not breath the fumes.
2. If inside, ventilate the area and/or use exhaust at the arc to remove welding fumes and gases.
3. If ventilation is poor, use an approved air-supplied respirator.
4. Read the Material Safety Data Sheets (MSDSs) and the manufacturer's instruction for metals, consumables, coatings, and cleaners.
5. Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Shielding gases used for welding can displace air causing injury or death. Be sure the breathing air is safe.
6. Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.

Eye protection filter shade selector for welding or cutting (goggles or helmet), from AWS A6.2-73.

Welding or cutting	*Electrode Size*	*Filter*	*Welding or cutting*	*Electrode Size*	*Filter*
Torch soldering		2	**Gas metal-arc**		
Torch brazing		3 or 4	Non-ferrous base metal	All	11
Oxygen Cutting			Ferrous base metal	All	12
Light	Under 1 in., 25 mm	3 or 4	Gas tungsten arc welding	All	12
Medium	1 to 6 in., 25-150 mm	4 or 5	(TIG)	All	12
Heavy	Over 6 in., 150 mm	5 or 6	Atomic hydrogen welding	All	12
Gas welding			Carbon arc welding	All	12
Light	Under 1/8 in., 3 mm	4 or 5	Plasma arc welding		
Medium	1/8 to 1/2 in., 3-12 mm	5 or 6	**Carbon arc air gouging**		
Heavy	Over 1/2 in., 12 mm	6 or 8	Light		12
Shielded metal-arc	Under 5/32 in., 4 mm	10	Heavy		14
	5/32 to 1/4 in.,	12	**Plasma arc cutting**		
	Over 1/4 in., 6.4 mm	14	Light	Under 300 Amp	9
			Medium	300 to 400 Amp	12
			Heavy	Over 400 Amp	14

7. Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and if necessary, while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.

WARNING

WELDING can cause fire or explosion.

Sparks and spatter fly off from the welding arc. The flying sparks and hot metal, weld spatter, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of electrode or welding wire to metal objects can cause sparks, overheating, or fire.

1. Protect yourself and others from flying sparks and hot metal.
2. Do not weld where flying sparks can strike flammable material.
3. Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
4. Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
5. Watch for fire, and keep a fire extinguisher nearby.
6. Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
7. Do not weld on closed containers such as tanks or drums.
8. Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock and fire hazards.
9. Do not use welder to thaw frozen pipes.
10. Remove stick electrode from holder or cut off welding wire at contact tip when not in use.

WARNING

FLYING SPARKS AND HOT METAL can cause injury.

Chipping and grinding cause flying metal. As welds cool, they can throw off slag.

1. Wear approved face shield or safety goggles. Side shields recommended.
2. Wear proper body protection to protect skin.

WARNING

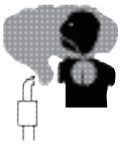
CYLINDERS can explode if damaged.

Shielding gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Since gas cylinders are normally part of the welding process, be sure to treat them carefully.

1. Protect compressed gas cylinders from excessive heat, mechanical shocks, and arcs.
2. Install and secure cylinders in an upright position by chaining them to a stationary support or equipment cylinder rack to prevent falling or tipping.
3. Keep cylinders away from any welding or other electrical circuits.
4. Never allow a welding electrode to touch any cylinder.
5. Use only correct shielding gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them and associated parts in good condition.
6. Turn face away from valve outlet when opening cylinder valve.
7. Keep protective cap in place over valve except when cylinder is in use or connected for use.
8. Read and follow instructions on compressed gas cylinders, associated equipment, and CGA publication P-1 listed in Safety Standards.

WARNING

Engines can be dangerous.



WARNING

ENGINE EXHAUST GASES can kill.

Engines produce harmful exhaust gases.

1. Use equipment outside in open, well-ventilated areas.
2. If used in a closed area, vent engine exhaust outside and away from any building air intakes.

WARNING

ENGINE FUEL can cause fire or explosion.

Engine fuel is highly flammable.

1. Stop engine before checking or adding fuel.
2. Do not add fuel while smoking or if unit is near any sparks or open flames.
3. Allow engine to cool before fueling. If possible, check and add fuel to cold engine before beginning job.
4. Do not overfill tank — allow room for fuel to expand.
5. Do not spill fuel. If fuel is spilled, clean up before starting engine.

WARNING

MOVING PARTS can cause injury.

Moving parts, such as fans, rotors, and belts can cut fingers and hands and catch loose clothing.

1. Keep all doors, panels, covers, and guards closed and securely in place.
2. Stop engine before installing or connecting unit.
3. Have only qualified people remove guards or covers for maintenance and troubleshooting as necessary.
4. To prevent accidental starting during servicing, disconnect negative (-) battery cable from battery.
5. Keep hands, hair, loose clothing, and tools away from moving parts.
6. Reinstall panels or guards and close doors when servicing is finished and before starting engine.

WARNING

SPARKS can cause BATTERY GASES TO EXPLODE; BATTERY ACID can burn eyes and skin.

Batteries contain acid and generate explosive gases.

1. Always wear a face shield when working on a battery.
2. Stop engine before disconnecting or connecting battery cables.
3. Do not allow tools to cause sparks when working on a battery.
4. Do not use welder to charge batteries or jump start vehicles.
5. Observe correct polarity (+ and –) on batteries.

WARNING

STEAM AND PRESSURIZED HOT COOLANT can burn face, eyes, and skin.

The coolant in the radiator can be very hot and under pressure.

1. Do not remove radiator cap when engine is hot. Allow engine to cool.
2. Wear gloves and put a rag over cap area when removing cap.
3. Allow pressure to escape before completely removing cap.

WARNING

This product, when used for welding or cutting, produces fumes or gases which contain chemicals know to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety code Sec. 25249.5 et seq.)

NOTE

Considerations About Welding And The Effects of Low Frequency Electric and Magnetic Fields

The following is a quotation from the General Conclusions Section of the U.S. Congress, Office of Technology Assessment, Biological Effects of Power Frequency Electric & Magnetic Fields - Background Paper, OTA-BP-E-63 (Washington, DC: U.S. Government Printing Office, May 1989): "...there is now a very large volume of scientific findings based on experiments at the cellular level and from studies with animals and people which clearly establish that low frequency magnetic fields and interact with, and produce changes in, biological systems. While most of this work is of very high quality, the results are complex. Current scientific understanding does not yet allow us to interpret the evidence in a single coherent framework. Even more frustrating, it does not yet allow us to draw definite conclusions about questions of possible risk or to offer clear science-based advice on strategies to minimize or avoid potential risks."

To reduce magnetic fields in the workplace, use the following procedures.

1. Keep cables close together by twisting or taping them.
2. Arrange cables to one side and away from the operator.
3. Do not coil or drape cable around the body.
4. Keep welding power source and cables as far away from body as practical.

ABOUT PACEMAKERS:

The above procedures are among those also normally recommended for pacemaker wearers. Consult your doctor for complete information.

1.02 PRINCIPAL SAFETY STANDARDS

Safety in Welding and Cutting, ANSI Standard Z49.1, from American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33126.

Safety and Health Standards, OSHA 29 CFR 1910, from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers That Have Held Hazardous Substances, American Welding Society Standard AWS F4.1, from American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33126.

National Electrical Code, NFPA Standard 70, from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, from Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202.

Code for Safety in Welding and Cutting, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3.

Safe Practices for Occupation and Educational Eye and Face Protection, ANSI Standard Z87.1, from American National Standards Institute, 1430 Broadway, New York, NY 10018.

Cutting and Welding Processes, NFPA Standard 51B, from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

1.03 PRECAUTIONS DE SECURITE EN SOUDAGE A L'ARC

MISE EN GARDE

LE SOUDAGE A L'ARC EST DANGEREUX

PROTEGEZ-VOUS, AINSI QUE LES AUTRES, CONTRE LES BLESSURES GRAVES POSSIBLES OU LA MORT. NE LAISSEZ PAS LES ENFANTS S'APPROCHER, NI LES PORTEURS DE STIMULATEUR CARDIAQUE (A MOINS QU'ILS N'AIENT CONSULTE UN MEDECIN). CONSERVEZ CES INSTRUCTIONS. LISEZ LE MANUEL D'OPERATION OU LES INSTRUCTIONS AVANT D'INSTALLER, UTILISER OU ENTRETENIR CET EQUIPEMENT.

Les produits et procédés de soudage peuvent sauser des blessures graves ou la mort, de même que des dommages au reste du matériel et à la propriété, si l'utilisateur n'adhère pas strictement à toutes les règles de sécurité et ne prend pas les précautions nécessaires.

En soudage et coupage, des pratiques sécuritaires se sont développées suite à l'expérience passée. Ces pratiques doivent être apprises par étude ou entraînement avant d'utiliser l'equipement. Toute personne n'ayant pas suivi un entraînement intensif en soudage et coupage ne devrait pas tenter de souder. Certaines pratiques concernent les équipements raccordés aux lignes d'alimentation alors que d'autres s'adressent aux groupes électrogènes.

La norme Z49.1 de l'American National Standard, intitulée "SAFETY IN WELDING AND CUTTING" présente les pratiques sécuritaires à suivre. Ce document ainsi que d'autres guides que vous devriez connaître avant d'utiliser cet équipement sont présentés à la fin de ces instructions de sécurité.

SEULES DES PERSONNES QUALIFIEES DOIVENT FAIRE DES TRAVAUX D'INSTALLATION, DE REPARATION, D'ENTRETIEN ET D'ESSAI.

1.04 Dangers relatifs au soudage à l'arc

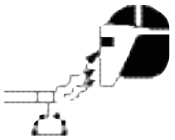
AVERTISSEMENT

L'ELECTROCUTION PEUT ETRE MORTELLE.

Une décharge électrique peut tuer ou brûler gravement. L'électrode et le circuit de soudage sont sous tension dès la mise en circuit. Le circuit d'alimentation et les circuits internes de l'équipement sont aussi sous tension dès la mise en marche. En soudage automatique ou semi-automatique avec fil, ce dernier, le rouleau ou la bobine de fil, le logement des galets d'entrainement et toutes les pièces métalliques en contact avec le fil de soudage sont sous tension. Un équipement inadéquatement installé ou inadéquatement mis à la terre est dangereux.

1. Ne touchez pas à des pièces sous tension.
2. Portez des gants et des vêtements isolants, secs et non troués.
3 Isolez-vous de la pièce à souder et de la mise à la terre au moyen de tapis isolants ou autres.
4. Déconnectez la prise d'alimentation de l'équipement ou arrêtez le moteur avant de l'installer ou d'en faire l'entretien. Bloquez le commutateur en circuit ouvert ou enlevez les fusibles de l'alimentation afin d'éviter une mise en marche accidentelle.
5. Veuillez à installer cet équipement et à le mettre à la terre selon le manuel d'utilisation et les codes nationaux, provinciaux et locaux applicables.
6. Arrêtez tout équipement après usage. Coupez l'alimentation de l'équipement s'il est hors d'usage ou inutilisé.
7. N'utilisez que des porte-électrodes bien isolés. Ne jamais plonger les porte-électrodes dans l'eau pour les refroidir. Ne jamais les laisser traîner par terre ou sur les pièces à souder. Ne touchez pas aux porte-électrodes raccordés à deux sources de courant en même temps. Ne jamais toucher quelqu'un d'autre avec l'électrode ou le porte-électrode.
8. N'utilisez pas de câbles électriques usés, endommagés, mal épissés ou de section trop petite.

9. N'enroulez pas de câbles électriques autour de votre corps.
10. N'utilisez qu'une bonne prise de masse pour la mise à la terre de la pièce à souder.
11. Ne touchez pas à l'électrode lorsqu'en contact avec le circuit de soudage (terre).
12. N'utilisez que des équipements en bon état. Réparez ou remplacez aussitôt les pièces endommagées.
13. Dans des espaces confinés ou mouillés, n'utilisez pas de source de courant alternatif, à moins qu'il soit muni d'un réducteur de tension. Utilisez plutôt une source de courant continu.
14. Portez un harnais de sécurité si vous travaillez en hauteur.
15. Fermez solidement tous les panneaux et les capots.



AVERTISSEMENT

LE RAYONNEMENT DE L'ARC PEUT BRÛLER LES YEUX ET LA PEAU; LE BRUIT PEUT ENDOMMAGER L'OUIE.

L'arc de soudage produit une chaleur et des rayons ultraviolets intenses, susceptibles de brûler les yeux et la peau. Le bruit causé par certains procédés peut endommager l'ouïe.

1. Portez une casque de soudeur avec filtre oculaire de nuance appropriée (consultez la norme ANSI Z49 indiquée ci-après) pour vous protéger le visage et les yeux lorsque vous soudez ou que vous observez l'exécution d'une soudure.
2. Portez des lunettes de sécurité approuvées. Des écrans latéraux sont recommandés.
3. Entourez l'aire de soudage de rideaux ou de cloisons pour protéger les autres des coups d'arc ou de l'éblouissement; avertissez les observateurs de ne pas regarder l'arc.
4. Portez des vêtements en matériaux ignifuges et durables (laine et cuir) et des chaussures de sécurité.
5. Portez un casque antibruit ou des bouchons d'oreille approuvés lorsque le niveau de bruit est élevé.

SELECTION DES NUANCES DE FILTRES OCULAIRS POUR LA PROTECTION DES YEUX EN COUPAGE ET SOUDAGE (selon AWS á 8.2-73)

Opération de coupage ou soudage	Dimension d'électrode ou Epiasseur de métal ou Intensité de courant	Nuance de filtre oculaire	Opération de coupage ou soudage	Dimension d'électrode ou Epiasseur de métal ou Intensité de courant	Nuance de filtre oculaire
Brassage tendre au chalumeau	toutes conditions	2	Soudage á l'arc sous gaz avec fil plein (GMAW)		
Brassage fort au chalumeau	toutes conditions	3 ou 4	métaux non-ferreux	toutes conditions	11
Oxycoupage			métaux ferreux	toutes conditions	12
mince	moins de 1 po. (25 mm)	2 ou 3	Soudage á l'arc sous gaz avec électrode de tungstène (GTAW)	toutes conditions	12
moyen	de 1 á 6 po. (25 á 150 mm)	4 ou 5	Soudage á l'hydrogène atomique (AHW)	toutes conditions	12
épais	plus de 6 po. (150 mm)	5 ou 6	Soudage á l'arc avec électrode de carbone (CAW)	toutes conditions	12
Soudage aux gaz			Soudage á l'arc Plasma (PAW)	toutes dimensions	12
mince	moins de 1/8 po. (3 mm)	4 ou 5	Gougeage Air-Arc avec électrode de carbone		
moyen	de 1/8 á 1/2 po. (3 á 12 mm)	5 ou 6	mince		12
épais	plus de 1/2 po. (12 mm)	6 ou 8	épais		14
Soudage á l'arc avec électrode enrobees (SMAW)	moins de 5/32 po. (4 mm)	10	Coupage á l'arc Plasma (PAC)		
	5/32 á 1/4 po. (4 á 6.4 mm)	12	mince	moins de 300 amperès	9
	plus de 1/4 po. (6.4 mm)	14	moyen	de 300 á 400 amperès	12
			épais	plus de 400 amperès	14

AVERTISSEMENT

LES VAPEURS ET LES FUMEES SONT DANGEREUSES POUR LA SANTE.

Le soudage dégage des vapeurs et des fumées dangereuses à respirer.

1. Eloignez la tête des fumées pour éviter de les respirer.
2. A l'intérieur, assurez-vous que l'aire de soudage est bien ventilée ou que les fumées et les vapeurs sont aspirées à l'arc.
3. Si la ventilation est inadequate, portez un respirateur à adduction d'air approuvé.
4. Lisez les fiches signalétiques et les consignes du fabricant relatives aux métaux, aux produits consummables, aux revêtements et aux produits nettoyants.
5. Ne travaillez dans un espace confiné que s'il est bien ventilé; sinon, portez un respirateur à adduction d'air. Les gaz protecteurs de soudage peuvent déplacer l'oxygène de l'air et ainsi causer des malaises ou la mort. Assurez-vous que l'air est propre à la respiration.
6. Ne soudez pas à proximité d'opérations de dégraissage, de nettoyage ou de pulvérisation. La chaleur et les rayons de l'arc peuvent réagir avec des vapeurs et former des gaz hautement toxiques et irritants.
7. Ne soudez des tôles galvanisées ou plaquées au plomb ou au cadmium que si les zones à souder ont été grattées à fond, que si l'espace est bien ventilé; si nécessaire portez un respirateur à adduction d'air. Car ces revêtements et tout métal qui contient ces éléments peuvent dégager des fumées toxiques au moment du soudage.

AVERTISSEMENT

LE SOUDAGE PEUT CAUSER UN INCENDIE OU UNE EXPLOSION

L'arc produit des étincellies et des projections. Les particules volantes, le métal chaud, les projections de soudure et l'équipement surchauffé peuvent causer un incendie et des brûlures. Le contact accidentel de l'électrode ou du fil-électrode avec un objet métallique peut provoquer des étincelles, un échauffement ou un incendie.

1. Protégez-vous, ainsi que les autres, contre les étincelles et du métal chaud.
2. Ne soudez pas dans un endroit où des particules volantes ou des projections peuvent atteindre des matériaux inflammables.
3. Enlevez toutes matières inflammables dans un rayon de 10, 7 mètres autour de l'arc, ou couvrez-les soigneusement avec des bâches approuvées.
4. Méfiez-vous des projections brulantes de soudage susceptibles de pénétrer dans des aires adjacentes par de petites ouvertures ou fissures.
5. Méfiez-vous des incendies et gardez un extincteur à portée de la main.
6. N'oubliez pas qu'une soudure réalisée sur un plafond, un plancher, une cloison ou une paroi peut enflammer l'autre côté.
7. Ne soudez pas un récipient fermé, tel un réservoir ou un baril.
8. Connectez le câble de soudage le plus près possible de la zone de soudage pour empêcher le courant de suivre un long parcours inconnu, et prévenir ainsi les risques d'électrocution et d'incendie.
9. Ne dégelez pas les tuyaux avec un source de courant.
10. Otez l'électrode du porte-électrode ou coupez le fil au tube-contact lorsqu'inutilisé après le soudage.
11. Portez des vêtements protecteurs non huileux, tels des gants en cuir, une chemise épaisse, un pantalon revers, des bottines de sécurité et un casque.

AVERTISSEMENT

LES ETINCELLES ET LES PROJECTIONS BRULANTES PEUVENT CAUSER DES BLESSURES.

Le piquage et le meulage produisent des particules métalliques volantes. En refroidissant, la soudure peut projeter du éclats de laitier.

1. Portez un écran facial ou des lunettes protectrices approuvées. Des écrans latéraux sont recommandés.
2. Portez des vêtements appropriés pour protéger la peau.

AVERTISSEMENT

LES BOUTEILLES ENDOMMAGEES PEUVENT EXPLOSER

Les bouteilles contiennent des gaz protecteurs sous haute pression. Des bouteilles endommagées peuvent exploser. Comme les bouteilles font normalement partie du procédé de soudage, traitez-les avec soin.

1. Protégez les bouteilles de gaz comprimé contre les sources de chaleur intense, les chocs et les arcs de soudage.
2. Enchainez verticalement les bouteilles à un support ou à un cadre fixe pour les empêcher de tomber ou d'être renversées.
3. Eloignez les bouteilles de tout circuit électrique ou de tout soudage.
4. Empêchez tout contact entre une bouteille et une électrode de soudage.
5. N'utilisez que des bouteilles de gaz protecteur, des détendeurs, des boyauxs et des raccords conçus pour chaque application spécifique; ces équipements et les pièces connexes doivent être maintenus en bon état.
6. Ne placez pas le visage face à l'ouverture du robinet de la bouteille lors de son ouverture.
7. Laissez en place le chapeau de bouteille sauf si en utilisation ou lorsque raccordé pour utilisation.
8. Lisez et respectez les consignes relatives aux bouteilles de gaz comprimé et aux équipements connexes, ainsi que la publication P-1 de la CGA, identifiée dans la liste de documents ci-dessous.

AVERTISSEMENT

LES MOTEURS PEUVENT ETRE DANGEREUX

LES GAZ D'ECHAPPEMENT DES MOTEURS PEUVENT ETRE MORTELS.

Les moteurs produisent des gaz d'échappement nocifs.

1. Utilisez l'équipement à l'extérieur dans des aires ouvertes et bien ventilées.
2. Si vous utilisez ces équipements dans un endroit confiné, les fumées d'échappement doivent être envoyées à l'extérieur, loin des prises d'air du bâtiment.

AVERTISSEMENT

LE CARBURANT PEUR CAUSER UN INCENDIE OU UNE EXPLOSION.

Le carburant est hautement inflammable.

1. Arrêtez le moteur avant de vérifier le niveau e carburant ou de faire le plein.
2. Ne faites pas le plein en fumant ou proche d'une source d'étincelles ou d'une flamme nue.
3. Si c'est possible, laissez le moteur refroidir avant de faire le plein de carburant ou d'en vérifier le niveau au début du soudage.
4. Ne faites pas le plein de carburant à ras bord: prévoyez de l'espace pour son expansion.
5. Faites attention de ne pas renverser de carburant. Nettoyez tout carburant renversé avant de faire démarrer le moteur.

AVERTISSEMENT

DES PIECES EN MOUVEMENT PEUVENT CAUSER DES BLESSURES.

Des pièces en mouvement, tels des ventilateurs, des rotors et des courroies peuvent couper doigts et mains, ou accrocher des vêtements amples.

1. Assurez-vous que les portes, les panneaux, les capots et les protecteurs soient bien fermés.
2. Avant d'installer ou de connecter un système, arrêtez le moteur.
3. Seules des personnes qualifiées doivent démonter des protecteurs ou des capots pour faire l'entretien ou le dépannage nécessaire.
4. Pour empêcher un démarrage accidentel pendant l'entretien, débranchez le câble d'accumulateur à la borne négative.
5. N'approchez pas les mains ou les cheveux de pièces en mouvement; elles peuvent aussi accrocher des vêtements amples et des outils.

6. Réinstallez les capots ou les protecteurs et fermez les portes après des travaux d'entretien et avant de faire démarrer le moteur.

AVERTISSEMENT

DES ETINCELLES PEUVENT FAIRE EXPLOSER UN ACCUMULATEUR; L'ELECTROLYTE D'UN ACCUMU-LATEUR PEUT BRULER LA PEAU ET LES YEUX.

Les accumulateurs contiennent de l'électrolyte acide et dégagent des vapeurs explosives.

1. Portez toujours un écran facial en travaillant sur un accumu-lateur.
2. Arrêtez le moteur avant de connecter ou de déconnecter des câbles d'accumulateur.
3. N'utilisez que des outils anti-étincelles pour travailler sur un accumulateur.
4. N'utilisez pas une source de courant de soudage pour charger un accumulateur ou survolter momentanément un véhicule.
5. Utilisez la polarité correcte (+ et –) de l'accumulateur.

AVERTISSEMENT

LA VAPEUR ET LE LIQUIDE DE REFROIDISSEMENT BRULANT SOUS PRESSION PEUVENT BRULER LA PEAU ET LES YEUX.

Le liquide de refroidissement d'un radiateur peut être brûlant et sous pression.

1. N'ôtez pas le bouchon de radiateur tant que le moteur n'est pas refroidi.
2. Mettez des gants et posez un torchon sur le bouchon pour l'ôter.
3. Laissez la pression s'échapper avant d'ôter complètement le bouchon.

1.05 PRINCIPALES NORMES DE SECURITE

Safety in Welding and Cutting, norme ANSI Z49.1, American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33128.

Safety and Health Standards, OSHA 29 CFR 1910, Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers That Have Held Hazardous Substances, norme AWS F4.1, American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33128.

National Electrical Code, norme 70 NFPA, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

Safe Handling of Compressed Gases in Cylinders, document P-1, Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202.

Code for Safety in Welding and Cutting, norme CSA W117.2 Association canadienne de normalisation, Standards Sales, 276 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3.

Safe Practices for Occupation and Educational Eye and Face Protection, norme ANSI Z87.1, American National Standards Institute, 1430 Broadway, New York, NY 10018.

Cutting and Welding Processes, norme 51B NFPA, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

1.06 DECLARATION OF CONFORMITY

Manufacturer: Victor Technologies
Address: 16052 Swingley Ridge Road, Suite 300
Chersterfiedl, MO 63017
USA

CE

The equipment described in this manual conforms to all applicable aspects and regulations of the 'Low Voltage Directive' (European Council Directive 73/23/EEC as amended by Council Directive 93/68/EEC) and to the National legislation for the enforcement of this Directive.

The equipment described in this manual conforms to all applicable aspects and regulations of the "EMC Directive" (European Council Directive 89/336/EEC) and to the National legislation for the enforcement of this Directive.

Serial numbers are unique with each individual piece of equipment and details description, parts used to manufacture a unit and date of manufacture.

National Standard and Technical Specifications

The product is designed and manufactured to a number of standards and technical requirements. Among them are:

- CSA (Canadian Standards Association) standard C22.2 number 60 for Arc welding equipment.
- UL (Underwriters Laboratory) rating 94VO flammability testing for all printed-circuit boards used.
- CENELEC EN50199 EMC Product Standard for Arc Welding Equipment.
- ISO/IEC 60974-1 (BS 638-PT10) (EN 60 974-1) (EN50192) (EN50078) applicable to plasma cutting equipment and associated accessories.
- For environments with increased hazard of electrical shock, Power Supplies bearing the S mark conform to EN50192 when used in conjunction with hand torches with exposed cutting tips, if equipped with properly installed standoff guides.
- Extensive product design verification is conducted at the manufacturing facility as part of the routine design and manufacturing process. This is to ensure the product is safe, when used according to instructions in this manual and related industry standards, and performs as specified. Rigorous testing is incorporated into the manufacturing process to ensure the manufactured product meets or exceeds all design specifications.

Thermadyne has been manufacturing products for more than 30 years, and will continue to achieve excellence in our area of manufacture.

Manufacturers responsible representative:

Steve Ward
Operations Director
Thermadyne Europe
Europa Building
Chorley N Industrial Park
Chorley, Lancashire,
England PR6 7BX

1.07 LIMITED WARRANTY

LIMITED WARRANTY: Thermal Arc®, Inc., A Thermadyne Company, hereafter, "Thermal Arc" warrants to customers of itsauthorized distributors hereafter "Purchaser" that its products will be free of defects in workmanship or material. Should anyfailure to conform to this warranty appear within the time period applicable to the Thermal Arc products as stated below, Thermal Arc shall, upon notification thereof and substantiation that the product has been stored, installed, operated, and maintained in accordance with Thermal Arc's specifications, instructions, recommendations and recognized standard industry practice, and not subject to misuse, repair, neglect, alteration, or accident, correct such defects by suitable repair or replacement, at Thermal Arc's sole option, of any components or parts of the product determined by Thermal Arc to be defective.

THERMAL ARC MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED. THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHERS, INCLUDING, BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

LIMITATION OF LIABILITY: THERMAL ARC SHALL NOT UNDER ANY CIRCUMSTANCES BE LIABLE FOR SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, SUCH AS, BUT NOT LIMITED TO, LOST PROFITS AND BUSINESS INTERRUPTION. The remedies of the Purchaser set forth herein are exclusive and the liability of Thermal Arc with respect to any contract, or anything done in connection therewith such as the performance or breach thereof, or from the manufacture, sale, delivery, resale, or use of any goods covered by or furnished by Thermal Arc whether arising out of contract, negligence, strict tort, or under any warranty, or otherwise, shall not, except as expressly provided herein, exceed the price of the goods upon which such liability is based. No employee, agent, or representative of Thermal Arc is authorized to change this warranty in any way or grant any other warranty.

PURCHASER'S RIGHTS UNDER THIS WARRANTY ARE VOID IF REPLACEMENT PARTS OR ACCESSORIES ARE USED WHICH IN THERMAL ARC'S SOLE JUDGEMENT MAY IMPAIR THE SAFETY OR PERFORMANCE OF ANY THERMAL ARC PRODUCT. PURCHASER'S RIGHTS UNDER THIS WARRANTY ARE VOID IF THE PRODUCT IS SOLD TO PURCHASER BY NON-AUTHORIZED PERSONS.

The warranty is effective for the time stated below beginning on the date that the authorized distributor delivers the products to the Purchaser. Notwithstanding the foregoing, in no event shall the warranty period extend more than the time stated plus one year from the date Thermal Arc delivered the product to the authorized distributor.

POWER SUPPLIES	ALL OTHER POWER SUPPLIES	LABOR
MAIN POWER MAGNETICS (STATIC & ROTATING)	3 YEARS	3 YEAR
ORIGINAL MAIN POWER RECTIFIER	3 YEARS	3 YEAR
CONTROL PC BOARD	3 YEARS	3 YEAR
ALL OTHER CIRCUITS AND COMPONENTS INCLUDING BUT NOT LIMITED TO: CONTACTORS, RELAYS, SOLENOIDS, PUMPS, POWER SWITCHING SEMI-CONDUCTORS.	1 YEAR	1 YEAR
ENGINES: ENGINES ARE NOT WARRANTED BY THERMAL ARC, ALTHOUGH MOST ARE WARRANTED BY THE ENGINE MANUFACTURER. SEE THE ENGINE MANUFACTURE'S WARRANTY FOR DETAILS.	1 YEAR	1 YEAR
CONSOLES, CONTROL EQUIPMENT, HEAT EXCHANGES		
ACCESSORY EQUIPMENT		

NOTE: Dragster 85® excluded from this policy. Refer to Dragster 85 warranty in Dragster 85 Owner's Manual.

Warranty repairs or replacement claims under this limited warranty must be submitted to Thermal Arc by an authorized Thermal Arc repair facility within thirty (30) days of purchaser's notice of any Warranty Claim. No transportation costs of any kind will be paid under this warranty. Transportation charges to send products to an authorized warranty repair facility shall be the responsibility of the Purchaser. All returned goods shall be at the Purchaser's risk and expense. This warranty supersedes all previous Thermal Arc warranties. Thermal Arc® is a Registered Trademark of Thermadyne Industries Inc.

September 27, 2004

SECTION 2: INTRODUCTION

2.01 How To Use This Manual

This Service Manual applies to just specification or part numbers listed on page i.

To ensure safe operation, read the entire manual, including the chapter on safety instructions and warnings.

Throughout this manual, the words **WARNING, CAUTION**, and **NOTE** may appear. Pay particular attention to the information provided under these headings. These special annotations are easily recognized as follows:

WARNING

A WARNING gives information regarding possible personal injury.

CAUTION

A CAUTION refers to possible equipment damage.

NOTE

A NOTE offers helpful information concerning certain operating procedures.

Additional copies of this manual may be purchased by contacting Thermal Arc at the address and phone number for your area given in the back cover. Include the Service Manual number and equipment identification numbers.

Electronic copies of this manual can also be downloaded at no charge in Acrobat PDF format by going to the Thermal Arc web site listed below and clicking on the Literature Library link:

http://www.thermalarc.com

2.02 Equipment Identification

The unit's identification number (specification or part number), model, and serial number usually appear on a nameplate attached to the control panel. In some cases, the nameplate may be attached to the rear panel. Equipment which does not have a control panel such as gun and cable assemblies is identified only by the specification or part number printed on the shipping container. Record these numbers on the bottom of page 1 for future reference.

2.03 Receipt Of Equipment

When you receive the equipment, check it against the invoice to make sure it is complete and inspect the equipment for possible damage due to shipping. If there is any damage, notify the carrier immediately to file a claim. Furnish complete information concerning damage claims or shipping errors to the location in your area listed in the inside back cover of this manual.

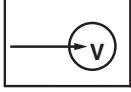
Include all equipment identification numbers as described above along with a full description of the parts in error.

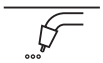
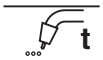
Move the equipment to the installation site before un-crating the unit. Use care to avoid damaging the equipment when using bars, hammers, etc., to un-crate the unit.

2.04 Symbol Chart

Note that only some of these symbols will appear on your model.

	On
	Off
	Dangerous Voltage
	Increase/Decrease
	Circuit Breaker
	AC Auxiliary Power
	Fuse
	Amperage
	Voltage
	Hertz (cycles/sec)
	Frequency
	Negative
	Positive
	Direct Current (DC)
	Protective Earth (Ground)
	Line
	Line Connection
	Auxiliary Power
115V 15A	Receptacle Rating- Auxiliary Power

	Single Phase
	Three Phase
	Three Phase Static Frequency Converter-Transformer-Rectifier
	Remote
	Duty Cycle
	Percentage
	Panel/Local
	Shielded Metal Arc Welding (SMAW)
	Gas Metal Arc Welding (GMAW)
	Gas Tungsten Arc Welding (GTAW)
	Air Carbon Arc Cutting (CAC-A)
	Constant Current
	Constant Voltage Or Constant Potential
	High Temperature
	Fault Indication
	Arc Force
	Touch Start (GTAW)
	Variable Inductance
	Voltage Input

	Wire Feed Function
	Wire Feed Towards Workpiece With Output Voltage Off.
	Welding Gun
	Purging Of Gas
	Continuous Weld Mode
	Spot Weld Mode
 t	Spot Time
t1	Preflow Time
t2	Postflow Time
	2 Step Trigger Operation Press to initiate wirefeed and welding, release to stop.
	4 Step Trigger Operation Press and hold for preflow, release to start arc. Press to stop arc, and hold for preflow.
t	Burnback Time
IPM	Inches Per Minute
MPM	Meters Per Minute
S	See Note
	See Note
	Art # A-04130_AB

Note: For environments with increased hazard of electrical shock, Power Supplier bearing the S mark conform to EN50192 when used in conjunction with hand torches with exposed tips, if equipped with properly installed standoff guides.

Cannot be disposed with household garbage.

2.05 General Description

The Thermal Arc™ Model 300GTSW is a three-phase or single-phase (if derated) AC/DC arc welding power source with Constant Current (CC) output characteristics. The unit is equipped with a gas control valve, built-in Sloper and Pulser, lift arc starter, and high-frequency arc starter for use with Gas Tungsten Arc Welding (GTAW), Gas Tungsten Arc Welding-Pulsed (GTAW-P), Gas Tungsten Arc Welding-Sloped (GTAW-S), and Shielded Metal Arc Welding (SMAW) processes.

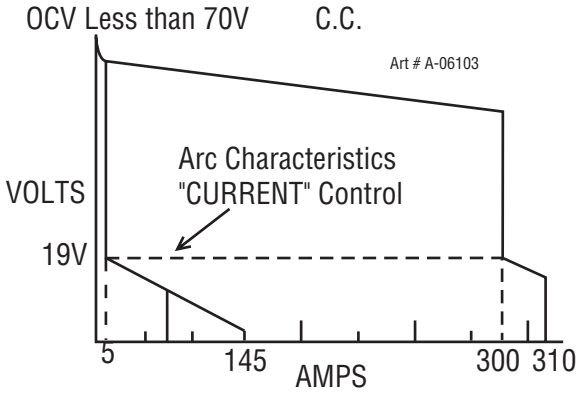


Figure 2-1: 300GTSW volt-ampere curve

NOTE

Volt-Ampere curves show the maximum Voltage and Amperage output capabilities of the welding power source. Curves of other settings will fall between the curves shown.

2.06 Functional Block Diagram

Figure 2-2 illustrates the functional block diagram of the 300GTSW power supply.

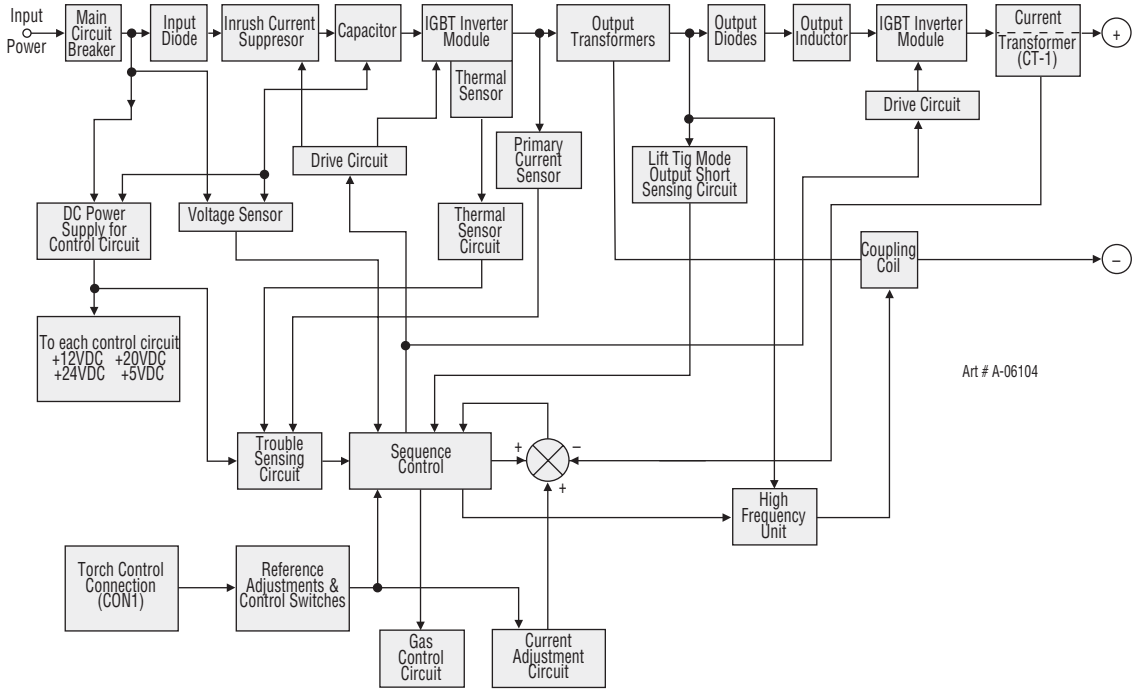


Figure 2-2: Block Diagram

WARNING

Disconnect primary power at the source before disassembling the power supply. Frequently review the Important Safety Precautions (page ii). Be sure the operator is equipped with proper gloves, clothing, eye and ear protection. Make sure no part of the operator's body comes into contact with the workpiece or any internal components while the unit is activated. Wait at least two minutes for the input capacitors to discharge before opening the enclosure.

2.07 Transporting Methods

These units are equipped with a handle for carrying purposes.

WARNING

ELECTRIC SHOCK can kill.

- DO NOT TOUCH live electrical parts.

- Disconnect input power conductors from de-energized supply line before moving welding power source.

WARNING

FALLING EQUIPMENT can cause serious personal injury and equipment damage.

- Lift unit with handle on top of case.
- Use hand cart or similar device of adequate capacity.
- If using a fork lift vehicle, place and secure unit on a proper skid before transporting.

2.08 Specifications

Parameter	208V/230V/460V				
Rated Output	**Three Phase**		**Single Phase**		
Amperes	300	250	300	250	
Volts	32	30	32	30	
Duty Cycle	25%	40%	25%	40%	
Output Range (Min. - Max.)	**TIG/STICK**				
Amperes	5-300 DC or 10-300 AC				
Volts	10-32 Volts				
Open Circuit Voltage					
Maximum OCV	64 V				
Input Data	50/60 Hz				
Dimensions/Weight					
Width	8.3 in (210 mm)				
Height	16.9 in (430 mm)				
Length	16.5 in (420 mm)				
Weight	46.2 lb (21 kg.)				
Output at Rated Output	**Three-Phase**	**Single-Phase**			**No Load**
Amperes	300	250	300	250	
Volts	32	30	32	30	
Duty Cycle	25%	40%	25%	40%	
KVA	15.7	12.3	19.8	15.5	0.5
KW	12.2	9.5	12.5	9.8	0.3
Output at No Load Input data 50/60 Hz/Duty Cycle					
KVA	0.5				
KW	0.3				
Input Volts	**Amperage Draw**				
	Three-Phase	**Single-Phase**			**No Load**
208	-	-	95	74	2.2
230	-	-	86	67	2.2
460	-	-	43	34	1.1
208	44	34	-	-	1.4
230	40	31	-	-	1.3
380	24	19	-	-	0.8
400	23	18	-	-	0.7
415	22	17	-	-	0.7
460	20	15	-	-	0.6

Table 2-2: Specifications

2.09 Duty Cycle

The duty cycle of a welding power source is the percentage of a ten (10) minute period that it can be operated at a given output without causing overheating and damage to the unit. If the welding amperes decrease, the duty cycle increases. If the welding amperage are increased beyond the rated output, the duty cycle will decrease.

WARNING

Exceeding the Duty Cycle Ratings will cause the Thermal Overload Protection Circuit to become energized and shut down the output until the unit has cooled to normal operating temperature.

Continually exceeding the Duty Cycle Ratings can cause damage to the welding power source.

To calculate duty cycle:

$$\text{current} = \sqrt{\frac{(\text{rated current})^2 \times (\text{rated duty cycle})}{(\text{desired duty cycle})}}$$

Art # A-06105

i.e. At the 300A rated output current, and 25% rated duty cycle, the operator wants to work on a 50% duty cycle. The maximum allowable current draw is:

$$\text{current} = \sqrt{\frac{(300\text{A})^2 \times (.25)}{(.50)}}$$

$$\text{current} = \sqrt{90{,}000 \times (0.5)}$$

$$\text{current} = \sqrt{45{,}000}$$

Art # A-06106

current = 212.1A

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SECTION 3: INSTALLATION

3.01 Electrical Input Connections

WARNING

ELECTRIC SHOCK can kill; SIGNIFICANT DC VOLTAGE is present after removal of input power.

- DO NOT TOUCH live electrical parts.
- SHUT DOWN welding power source, disconnect input power employing lockout/tag out procedures. Lockout/tag out procedures consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

Electrical Input Requirements

Operate the welding power source from a single or three-phase 50/60 Hz, AC power supply. The input voltage must match one of the electrical input voltages shown on the input data label on the unit nameplate. Contact the local electric utility for information about the type of electrical service available, how proper connections should be made, and inspection required.

The line disconnect switch provides a safe and convenient means to completely remove all electrical power from the welding power supply whenever necessary to inspect or service the unit.

NOTE

These units are equipped with a four-conductor with earth power cable that is connected at the welding power source end for single or three-phase electrical input power.

- To operate single-phase, do not connect the RED input conductor.
- Do not connect an input (WHITE, BLACK or RED) conductor to the ground terminal.
- Do not connect the ground (GREEN) conductor to an input line terminal.

Refer to figure 3-1 and:

1. Connect end of ground (GREEN) conductor to a suitable ground. Use a grounding method that complies with all applicable electrical codes.
2. Connect ends of line 1 (BLACK), line 2 (WHITE) and line 3 (RED) input conductors to a de-energized line disconnect switch.
3. Use Table 3-1 below as a guide to select line fuses for the disconnect switch.

Model	Input Voltage	Fuse Size (Amperes)	
		Three-Phase	Single-Phase
208-230 VAC	208/230 VAC	60	125
208-230/460 VAC	208-230 VAC	60	125
	460 VAC	23	75
380-415 VAC	380-415 VAC	30	N/A

Table 3-1: Fuse Size Selection

NOTE

Fuse size is based on not more than 200 percent of the rated input amperage of the welding power source (Based on Article 630, National Electrical Code).

Input Power

Each unit incorporates an INRUSH circuit and input voltage sensing circuit. When the MAIN CIRCUIT BREAKER is turned on, the inrush circuit provides a pre-charging of the input capacitors. SCR's in the Power Control Assembly (PCA) will turn on after the input capacitors have charged to full operating voltage (after approximately 5 seconds).

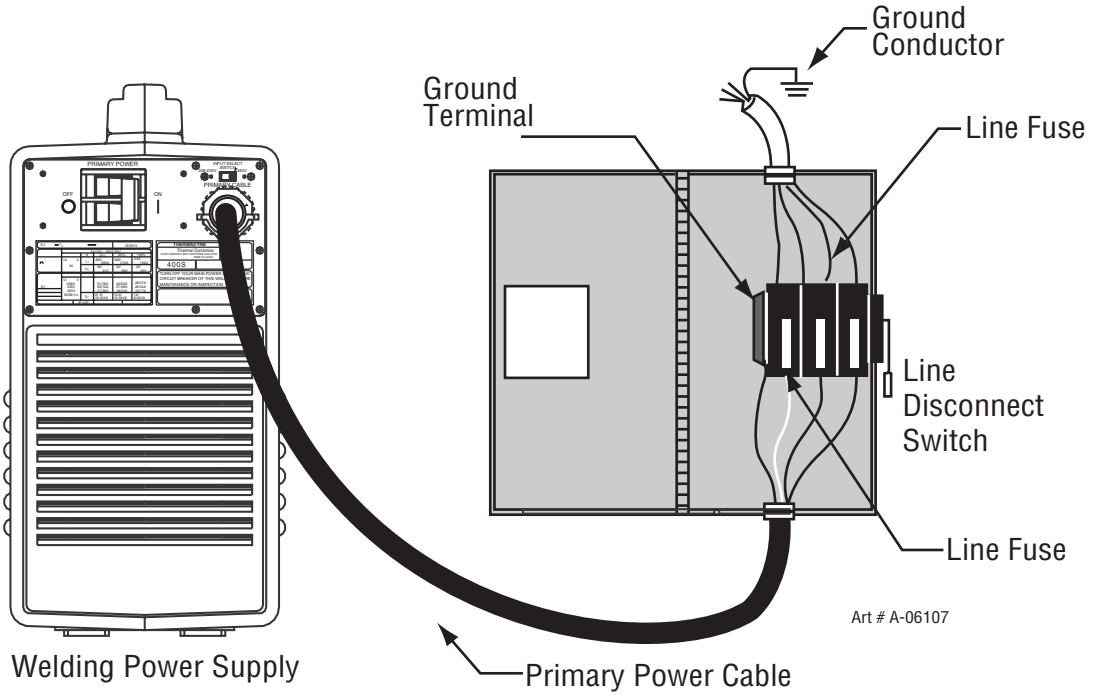

Figure 3-1: Electrical input connections

SECTION 4: OPERATION

4.01 Operator Controls

1. Amperage Control:

The Amperage Control selects the desired amperage within the entire range of the welding power source. Rotating this control in a clockwise direction increases the amperage output. The scale surrounding the amperage control represents approximate actual amperage values.

2. Hot Start Control:

The Hot Start Control provides a variable selection of start circuit current that operates in the STICK and HF TIG modes. The Hot Start time is approximately 0.01 seconds in TIG and 0.06 seconds in STICK. The current value is adjusted from 0 to 100 Amps over the determined weld current set by the Amperage Control. Rotating the control clockwise increases Hot Start current.

3. ARC Control:

The Arc Control is in use in the SMAW mode only. Rotate the control clockwise to increase the short circuit current available to control the welding arc.

4. Process Selector Switch:

The Process Selector Switch allows the operator to select the STICK welding (SMAW) process, LIFT TIG (GTAW) or HF TIG (GTAW) process.

5. Warning Indicator:

The Warning Indicator located on the front panel will become activated under the following conditions:

- Input voltage is too low
- Input voltage too high
- Thermal overload

6. AC Power Indicator:

The AC Power Indicator located on the front panel lights when the Primary Power Switch is in the ON position, indicating the unit is energized.

7. Output Selector Switch:

Selects between AC or DC output

8. Sloper Switch:

When in the OFF position the Sloper is inactive. Selecting the ON position activates the Sloper. Selecting the SPOT position activates the spot welding timer. The Slope sequence and spot modes are activated by a remote ON/OFF switch connected to the 8-pin receptacle. See the section on Slope sequence on next page.

9. Pulser Switch:

When in the OFF position the Pulser is inactive. Selecting H (HIGH) or L (LOW) will activate the TIG pulser. The Pulse Frequency can be adjusted by the Pulse Frequency control. Pulse width is fixed at 35%. Background current is fixed at 1/5th of the peak current.

10. AC Frequency Control:

When Output Selector Switch is in AC position, controls frequency of AC waveform on output.

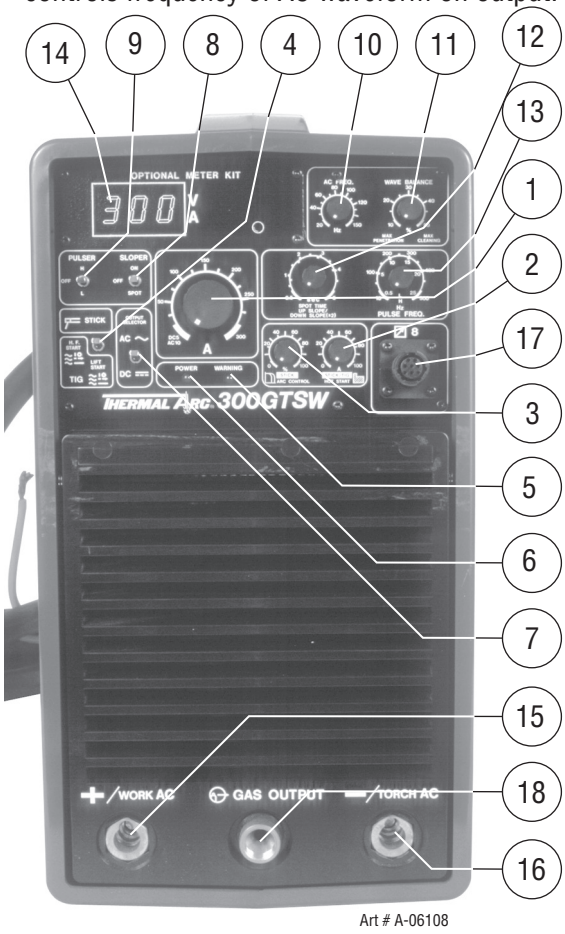

Figure 4-1: Front panel operator controls

11. Wave Balance:

This controls the portion of each AC output cycle that has its polarity reversed. The reverse polarity portion of the waveform is used to clean the oxides of aluminum as it is welded. The control is variable from 5% to 50%.

12. Spot Time Up/Down Slope Control:

This control provides Spot, Up and Down slope time control. Rotating the control clockwise increases the time. The scale surrounding the control represents approximate actual values. The Spot and Up slope time is adjustable from 0.5 to 5 seconds. The Down slope time is twice the Up slope time at 0.5 to 10 seconds.

13. Pulse Frequency Control:

The Pulse Frequency control provides a means of selecting the pulse frequency when the Pulse switch is in the H (HIGH) or L (LOW) position. Rotating the control clockwise increases the pulse frequency. The two scales surrounding the control represent approximate actual values. The pulse frequency is adjustable from 0.5 to 25 Hz in LOW and 10 to 500 Hz in HIGH.

14. LED Voltage/Amperage Display (optional)

15. Positive Terminal:

50mm DIN-style female receptacle.

16. Negative Terminal:

50mm DIN-style female receptacle.

17. 8-Pin Receptacle:

Used for remote contactor and amperage controls.

18. Output Gas Fitting:

Gas output; fitting size 5/8"-18 unf female

18. Output Gas Fitting (European model):

European model gas output. Accommodates 3/8" BSP monocable TIG torch.

NOTE

"F" and "G" revisions refer to the letter at the end of the serial number for this product.

Gas Solenoid:

The pre-flow is fixed at 150ms. On “F” revision and earlier units the post-flow is automatically adjusted from 1 to 30 seconds by the position of the welding Amperage Control. On “G” revision and later the unit has a separate post-flow adjustment from 0-60 seconds independent of current setting.

Sloper Sequence:

A. Remote ON/OFF switch closed:

Pre-flow starts to flow. In HF TIG mode HF and initial current is present after pre-flow. (In LIFT TIG mode HF is not present.) Initial current is 1/5th of the welding current.

B. Remote ON/OFF switch opened:

Current increases to welding current at the rate set by the UP/DOWN Slope control. Welding current is set by the Amperage Control.

C. Remote ON/OFF switch closed:

Current decreases to final current at twice the rate set for UP Slope. Final current is 1/5th of welding current.

D. Remote ON/OFF switch opened:

Arc shuts off and post-flow time initiated.

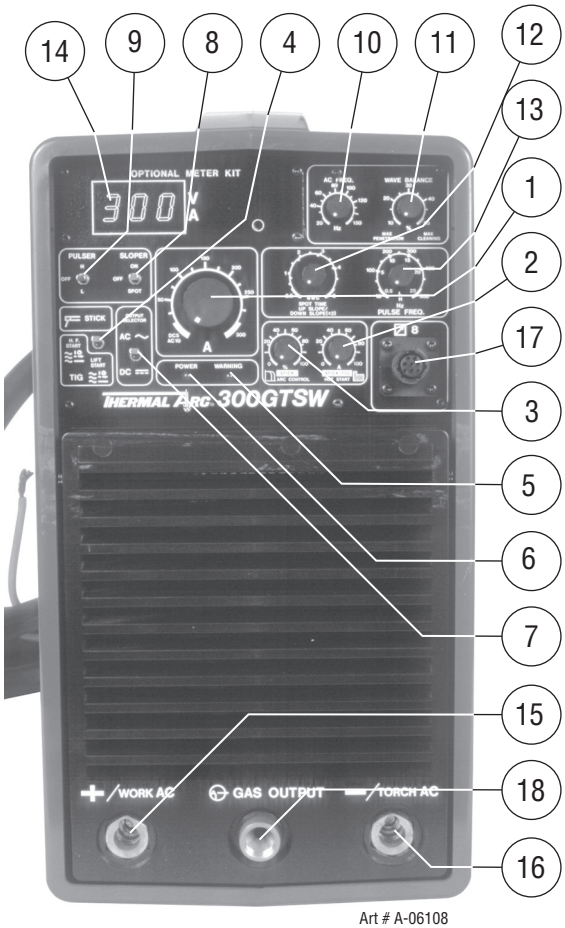

Figure 4-1: Front panel operator controls

1. Primary Power Switch:

Placing the Primary Power Switch (circuit breaker) located on the rear panel to the ON position energizes the welding power source.

2. Voltage Selector:

Manual slide switch selects the proper input voltage range. (208-230/460VAC Model only)

3. Input Cable:

10 feet

4. Input Gas Fitting:

The input gas connection is located on the bottom center of the rear panel. Size 5/8"-18 unf female, European Fitting - 3/8" BSP male. GTS Model only.

* If this slide switch is not set to the position that matches the input voltage from the electrical source, the warning indicator will be illuminated, and the unit will not operate. (Not installed in single voltage unit shown)

Figure 4-2: Rear panel operator controls (208/230 model shown)

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SECTION 5: SERVICE

5.01 Routine Maintenance

The only routine maintenance required for the power supply is a thorough cleaning and inspection, with the frequency determined by the usage and the operating environment.

WARNING

Disconnect primary power at the source before opening the enclosure. Wait at least two minutes before opening the enclosure to allow the primary capacitors to discharge.

To clean the unit, open the enclosure (please refer to Section 6.3, Opening the Enclosure) and use a vacuum cleaner to remove any accumulated dirt and dust. The unit should also be wiped clean, if necessary, with solvents that are recommended for cleaning electrical apparatus.

CAUTION

Do not blow air into the power supply during cleaning. Blowing air into the unit can cause metal particles to interfere with sensitive electrical components and cause damage to the unit.

5.02 Basic Troubleshooting

You should always attempt to isolate and fix a problem using this section first. This section on basic troubleshooting will help you isolate faults and problems that are easily remedied without requiring that the power supply be opened, or requiring specialized test equipment and procedures. If the problem or fault cannot be corrected by following the recommendations in this section, then proceed to Section 6.0 on Advanced Troubleshooting.

5.03 Common Welding Operation Faults

The following are some of the more common operating faults that occur during welding operations:

A. Power

Main power not connected

Main power not turned on

MAIN CIRCUIT BREAKER set of OFF position

INPUT SELECTOR (Easy Link) Switch in wrong position

B. Poor Weld

Wrong polarity

Wrong electrode used

Electrode not properly prepared

Incorrect welding amperage setting

Speed too slow or too fast

Incorrect switch settings for intended operation

Poor weld output connection(s)

C. Remote Operation

Incorrect contactor switch settings

Remote not connected

If the problem is not resolved after checking the above, the following guide may suggest more specific items to check given the faulty operating symptom(s) you are experiencing.

5.04 Specific Problems

How to Use This Guide

The following information is a guide to help you determine the most likely causes for various symptoms.

This guide is set up in the following manner:

A. Symptom (Bold Type)

Any special instructions (Text Type)

1. *Cause (Italic Type)*

   a. Check/Remedy (Text Type)

Locate your symptom, check the cause(s) (the simplest or most likely is listed first), then perform the remedy given. Repair as needed being sure to verify that the unit is fully operational after any repairs.

A. No Weld Output; Unit is Completely Inoperative

1. *Line disconnect switch is in OFF position*

   a. Place line disconnect switch in ON position.

2. *Line fuse(s) open*

   a. Check and replace line fuse(s).

3. *Improper electrical input connections*

   a. See Section 3.01 Electrical Input Requirements, page 3-1, for proper input connections.

4. *MAIN CIRCUIT BREAKER in OFF position*

   a. Check and reset MAIN CIRCUIT BREAKER if necessary.

5. *INPUT SELECTOR (Easy Link) switch is set to incorrect position for applied input voltage, 208/230/460 model only*

   a. Verify primary source voltage and set INPUT SELECT switch to correct setting.

B. WARNING Indicator is ON

1. *Unit is in thermal shutdown mode*

   a. Allow cooling period of approximately five (5) minutes with the power ON. Duty cycle should be reviewed. To reset the WARNING indicator, the power supply must be turned OFF, then ON again.

2. *Input voltage is low*

   a. Measure input voltage and verify that it matches the INPUT SELECTOR (Easy Link) switch setting. The length of the input power cable must be considered, as there will be a considerable voltage drop along its length.

3. *Erratic input voltage – spikes over tolerance will cause the warning light to come on for protection*

   a. Turn MCB off then on to reset the warning light.

C. Erratic or Improper Weld Output

1. *Loose welding cable connections*

   a. Tighten all welding cable connections.

2. *Incorrect welding cable size*

   a. Use proper size and type of cable. (see Operating Manual 0-2514)

3. *Improper input connections*

   a. Refer to Section 3.1 Electrical Input Requirements, page 3-1.

4. *Poor electrode condition*

   a. Replace electrode.

5. *If in GTAW mode, check the condition of the tungsten electrode*

   a. Use the recommended 2% Thoriated tungsten.

6. *In GTAW mode, incorrect argon gas flow*

   a. Verify that argon gas flow is correct; approximately 12 SCFH.

7. *Incorrectly set PROCESS SELECTOR switch*

   a. Verify the PROCESS SELECTOR switch is set to match the type of welding process being conducted.

8. *Wrong welding polarity*

   a. Verify output torch connections.

D. Wandering Arc, Poor Control of Arc Direction

1. *Wrong size tungsten electrode, typically larger than recommended*
   a. Use proper size electrode for amperage selected (see Operating Manual 0-2514).
2. *Improperly prepared tungsten electrode*
   a. Prepare tungsten properly.
3. *Gas Flow rate too high*
   a. Reduce flow rate to approximately 12 SCFH.
4. *Drafts blowing shielding gas away from tungsten electrode*
   a. Shield weld zone from drafts and check condition of tungsten electrode.
5. *Loose gas fitting on regulator or gas line drawing air into weld zone, causing green/blue discoloration of workpiece*
   a. Check and tighten all gas fittings.
6. *Water in torch*
   a. Refer to torch parts list for part(s) requiring replacement and repair torch as necessary.

E. No High Frequency at Torch When PROCESS SELECTOR Switch is in HF TIG Position

1. *PROCESS SELECTOR switch is not in the HF TIG position*
   a. Place switch in HF TIG position.
2. *Drafts blowing shielding gas away from tungsten electrode*
   a. Shield weld zone from drafts and check condition of tungsten electrode.
3. *Loose gas fitting on regulator or gas line drawing air into weld zone*
   a. Check and tighten all gas fittings.
4. *Water in torch*
   a. Refer to torch parts list for part(s) requiring replacement and repair torch as necessary.
5. *Tungsten condition is poor*
   a. Replace electrode.
6. *Electrode too high off metal*
   a. Reduce stand-off.
7. *Faulty Main Circuit Board (PCB1)*
   a. Refer to the Main Circuit Board section 6.11, page 6-10.
8. *Faulty Current Transformer CT1*
   a. With no welding arc established, measure for 0VDC between CN1 pins 3 and 4 on PCB1. Replace CT1 if voltage is greater than 0.1VDC.
9. *Faulty High Frequency Unit*
   a. Refer to section 6.39, page 6-46.
10. *Faulty TIG Torch*
   a. Replace TIG torch.
11. *Work lead not connected*
   a. Verify all connections to torch and workpiece.

F. Lack of High Frequency; Difficulty in Establishing an Arc

1. *Dissipation of high frequency from torch cable or conductive gas hose*
   a. Be sure that the torch cable is not near any grounded metal. Do not use conductive gas hose.
2. *Weld cable leakage*
   a. Check cables and torch for cracked or deteriorated insulation or bad connections. Repair or replace necessary parts.
3. *Poor ground connection to power supply*
   a. Verify ground by trying to strike arc within one inch (2.54cm) of ground clamp.

G. Wall Fuse/Circuit Breaker Trips When Turned ON

1. *Input voltage over rated limit*
   a. Connect to proper line voltage.
2. *Shorted primary inverter components*
   a. Perform the PCA Input Diode Bridge Test, section 6.24, page 6-24.
3. *Faulty PCB1*
   a. Replace PCB1. Refer to page 6-13.

H. Green AC POWER Indicator OFF; Fan Not Operating

1. *Input line disconnect switch in OFF position*
   a. Place input line disconnect switch to ON position.
2. *Power supply MAIN CIRCUIT BREAKER (MCB) in OFF position*
   a. Place MCB to ON position.
3. *Input line breaker tripped/fuses blown*
   a. Reset MCB; check primary supply breaker or fuses and replace if necessary. Refer to letter G.
4. *Power supply MCB faulty*
   a. Check external connections to the circuit breaker and continuity. Replace if necessary.

NOTE

Verify that for single-phase operation, the RED input line is not connected.

5. *Open conductor in input power line*
   a. Check continuity and replace if necessary.
6. *Faulty Main Circuit Board (PCB1)*
   a. Check the Main Circuit Board (PCB1) supply voltages. Refer to section 6.05, page 6-4. Replace the Main Circuit Board (PCB1) if any of the voltages are not present, page 6-13.
7. *Faulty auxiliary transformer (T3)*
   a. Check auxiliary transformer (T3) primary and secondary windings for shorts or open circuits and replace if necessary. Refer to section 6.33, page 6-38.

I. Red WARNING Indicator ON; No Weld Output

1. *Input voltage fluctuation causing protection circuits to activate*
   a. Monitor input power for spikes and high voltage conditions. Most power utilities will monitor and verify line voltage.
2. *Easy Link not operating correctly*
   a. Perform the Easy Link test, section 6.04, page 6-3.
3. *Thermal sensor TH1 open (thermal shutdown)*
   a. Allow the unit to cool for five minutes before turning the power supply ON. If the problem still occurs, perform the PCA Thermal Sensor (TH1) test, section 6.31, page 6-36.
4. *Warning Indicator ON when output energized.*
   a. Check Q1, Q2 and Q3, Q4 Section 6.26

J. Power Supply Works When in DC Output Mode, But Not in AC Output Mode

1. *Faulty IGBT modules (Q3/Q4)*
   a. Check IGBT modules Q3/Q4 for shorted gate circuit or defective diodes per section 6.26, page 6-26 and replace if necessary.

K. No Weld or Output; Fan Operating; WARNING Indicator OFF

1. *Faulty Remote Control Device*
   a. Connect a jumper between pins 2 and 3 of the REMOTE 8 receptacle for contactor closure. If amperage and voltage can be adjusted with front panel controls, repair or replace remote control device.
2. *Faulty Front Panel PCB*
   a. Refer to section 6.16, page 6-18, Front Panel Test Point Voltages.
3. *Faulty Main Circuit Board (PCB1)*
   a. Check all connections on the Main Circuit Board (PCB1). Perform Power Supply Voltage tests, section 6.05, page 6-4.
   b. Check PWM waveforms from front panel PCB to Main PCB and from Main PCB to the IGBT's.

L. Low or Maximum Weld Output With No Control

1. *Faulty remote control device*
   a. Connect a jumper between pins 2 and 3 of the REMOTE 8 receptacle for contactor closure. If amperage and voltage can be adjusted with front panel controls, repair or replace remote control device.
2. *Faulty Front Panel Circuit Board (PCB6)*
   a. Replace PCB6. Refer to section 6.16, page 6-18.

M. Limited Weld Output

1. *Poor primary input voltage*
   a. Check primary input voltageis within ±10% of nominal voltage, i.e. 230VAC ±10%.
2. *Faulty Current Transformer (CT1)*
   a. Check continuity and signals to current transformer CT. Refer to tests in section 6.05, page 6-4, and section 6.20, page 6-22

N. Erratic or Improper Weld Output

1. *Loose welding cable connections*
   a. Tighten all welding cable connections.
2. *Improper setup*
   a. Check for proper connection of input power.
   b. Perform Front Panel Test Point Voltage procedure, section 6.17, page 6-19.
3. *Faulty Remote Device*
   a. Check all remote devices and repair or replace if necessary.
4. *Faulty Current Transformer (CT1)*
   a. Check continuity and signals to current transformer CT. Refer to section 6.05, page 6-4, measuring between pins 3 and 4, and section 6.20, page 6-22.
5. *Tungsten condition is poor, causing discoloration of workpiece*
   a. Replace electrode.

O. No Weld Output; Fan Not Operating; WARNING Indicator OFF

1. *Line voltage too low*
   a. Verify that input voltage matches setting on rear panel INPUT SELECTOR switch.
   b. Verify the INPUT SELECTOR (Easy Link) switch is functioning properly by performing test in section 6.05, page 6-3.
2. *Loose connection on Main Circuit Board (PCB1)*
   a. Verify all connections.
3. *Faulty Main Circuit Board (PCB1)*
   a. Verify gate drive signals from Main Circuit Board by performing Gate Drive Enable Signal test in section 6.11, page 6-10.
4. *Faulty output diodes*
   a. Perform PCA Output Diode test in section 6.29, page 6-32.
5. *Faulty IGBT Inverter Module(s)*
   a. If there is weld output in AC output mode but not DC, perform PCA IGBT Inverter test on Q3, section 6.26, page 6-26.

P. Unit will not change polarity from AC to DC or DC to AC.

   a. Turn the post-flow control to minimum and try again. The post-flow circuit must be timed out before the unit will recognize a change in status.

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SECTION 6: ADVANCED TROUBLESHOOTING

If you are here, all of the troubleshooting suggestions in Section 5 - Basic Troubleshooting have either failed to resolve the faulty operation or have indicated that one or more of the subsystems within the power supply are defective. This section provides the information needed to take live measurements on the various subsystems within the power supply, and replace those subsystems that prove faulty.

CAUTION

Troubleshooting and repairing this unit is a process which should be undertaken only by those familiar with high voltage/high power electronic equipment.

WARNING

There are extremely dangerous voltage and power levels present inside this unit. Do not attempt to diagnose or repair unless you have training in power electronics measurement and troubleshooting techniques.

Under no circumstances are field repairs to be attempted on printed circuit boards or other subassemblies of this unit. Evidence of unauthorized repairs will void the factory warranty. If a subassembly is found to be defective by executing any of the procedures in this Manual, the subassembly should be replaced with a new one. The faulty subassembly should then be returned to Thermal Dynamics through established procedures.

WARNING

Disconnect primary power at the source before disassembling the power supply. Frequently review the Important Safety Precautions (page ii). Be sure the operator is equipped with proper gloves, clothing, eye and ear protection. Make sure no part of the operator's body comes into contact with the workpiece or any internal components while the unit is activated.

6.01 System-Level Fault Isolation

If none of the suggestions provided in Section 5 have solved the problem or corrected the faulty operation, the next step is to isolate one or more of the internal subassemblies that may be defective.

WARNING

There are extremely dangerous voltage and power levels present inside this unit. Do not attempt to diagnose or repair unless you have had training in power electronics measurement and troubleshooting techniques.

CAUTION

Perform all steps in each procedure, in sequence. Skipping portions of procedures, or performing steps out of sequence can result in damage to the unit, and possible injury, or worse, to the operator.

6.02 Opening the Enclosure

To open the enclosure:

1. Turn off the MAIN CIRCUIT BREAKER (MCB) on the rear of the power supply.
2. Wait at least two minutes to allow the input capacitors to discharge.
3. Remove the two screws on the top and three screws from bottom of the unit.
4. Remove the two screws from the middle of the case on both sides of the unit.
5. Pull the plastic enclosure halves open and away from the internal frame.
6. Remove the inner plastic shield by locating three (3) white plastic retaining plugs on the sides of the heatsink by pulling the plastic plug straight out of the hole in the heatsink. For reassembly, make a note of the relationship of the grounding screw and the fourth hole in the plastic shield that did not have a plastic plug.

To reassemble the enclosure:

1. Place the inner plastic shroud over the power supply so the three holes that will accept the plastic retaining plugs are in the correct position.
2. Insert the white plastic retaining plugs into the holes in the heatsink through the matching holes in the plastic shield.
3. Place the power supply into an enclosure half, taking care that the front and rear panel edges are seated properly into the matching grooves inside the enclosure. Repeat for the second enclosure half.
4. When the two enclosure halves are fully together, secure the two halves together with the five screws and matching nuts.
5. Install the two screws in the middle of each enclosure half.

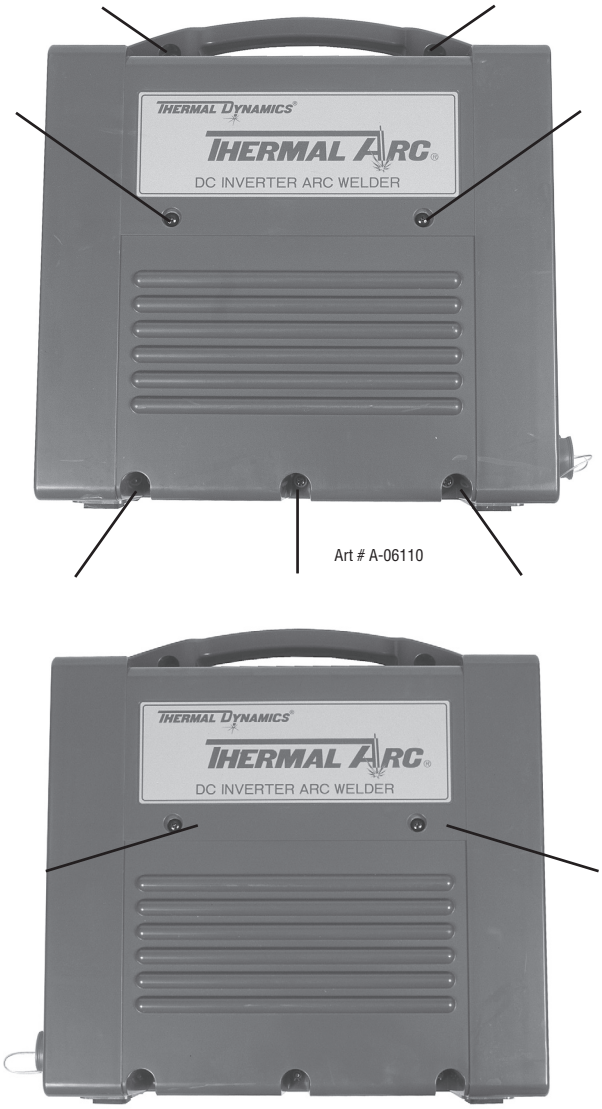


Figure 6-1: Screw locations on case.

6.03 Initial Setup Conditions

Before starting any of the system-level troubleshooting procedures that follow, set the front panel controls of the unit to the following. If necessary, refer to the Operator's Controls section 4, page 4-1, for the location of the various controls for the unit.

1. Set the PROCESS SELECTOR switch to STICK mode.
2. Set the OUTPUT MODE to DC OUTPUT position.
3. Set the AMPERAGE control to its minimum (fully counterclockwise) position.
4. No connection should be made to the remote receptacle(s).

6.04 Easy Link Fault Isolation Test (208-230/460VAC Model only)

The Easy Link circuit configures the internal power circuits to accept the input power. This test verifies that the INPUT SELECT switch is functioning properly, and the Easy Link circuit can detect both the maximum 460 and the minimum 208-230V input power, and correctly configure the internal power circuits for proper operation under both input power conditions.

1. Disconnect primary power at the source. Make sure the MAIN CIRCUIT BREAKER (MCB) is in the OFF position.
2. Set the INPUT SELECTOR switch on the rear panel to the low voltage (208-230VAC) range position.
3. Using an Ohmmeter, at CN13 on the Main Circuit Board between pins 1 (BLUE) and 3 (GREEN) should measure a short, and an open between CN13 pins 2 (GRAY) and 3 (GREEN).
4. Set the INPUT SELECTOR switch to the high voltage 460VAC range.
5. Using an Ohmmeter, at CN13 on the Main Circuit Board between pins 1 (BLUE) and 3 (GREEN) should measure an open, and a short between CN13 pins 2 (GRAY) and 3 (GREEN).

6.05 Power Supply Voltage Test

Refer to figure 6-2. For location of ribbon cables.

1. Connect the power supply to a source of either 208-230VAC or 460VAC.
2. Set the Input Select switch to match the input voltage.
3. Apply power to the unit and place the MAIN CIRCUIT BREAKER on the power supply to the ON position.
4. The voltage at CN-7 as listed in Step 9. If any voltages are incorrect then proceed to Step 6. If all readings are correct the proceed to Step 12.
5. Turn the unit OFF.
6. At the Front Panel Circuit Board, disconnect the ribbon cable at connector CN7. Pull up on the retaining bar to release the ribbon cable from the connector body.
7. Reapply power to the unit.
8. On the ribbon cable, measure for the following voltages between pins:

Pins 2 (-) and 1 (+)	+12VDC
Pins 2 (-) and 5 (+)	-12VDC
Pins 2 (-) and 3 (+)	+5VDC
Pins 2 (-) and 4 (+)	+5VDC

If voltages are correct with CN-7 disconnected but not with it connected, then the front panel PCB is defective.

9. Turn the unit OFF.
10. Reconnect the ribbon cable to connector CN7 on the Front Panel Circuit Board.
11. Reapply power to the unit.
12. On the Main Circuit Board (PCB1), measure the voltages between the following points:

CN1: Hall Effect

Pin 1 and pin 4	+12VDC
Pin 2 and pin 4	-12VDC
Pin 3 and pin 4	0V to +12VDC; varies with AMPERAGE output under load. 50A/V

CN2:

Pin 1 and pin 2	+24VDC

CN21:

Pin 1 and pin 2	+12VDC
Pin 3 and pin 2	+5VDC
Pin 4 and pin 2	+5VDC
Pin 5 and pin 2	-12VDC

CN22:

Pin 13 and pin 4	+12VDC

CN23:

Pin 3 and pin 2	+12VDC

If any of these voltages are not present or are below a 10% tolerance, replace the Main Circuit Board (PCB1).

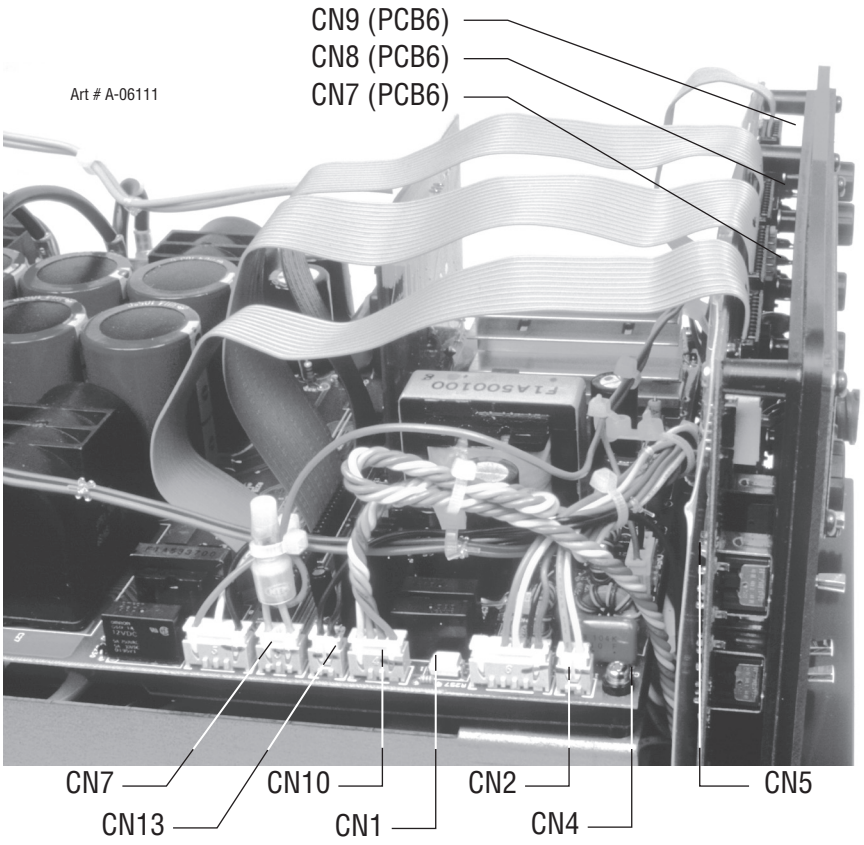


Figure 6-2: Power supply voltage connector locations.

6.06 Output Load Test

This test verifies that the output controls are functioning properly. A clamp-type amperage meter or equivalent meter capable of reading approximately 300A full-scale will be needed for this test if a digital meter is not present in the unit.

CAUTION

Before performing any portion of the procedure below, make certain the unit is placed in the initial setup condition as described at the beginning of this section, (page 6-2).

1. Place the AMPERAGE control in its minimum (fully counterclockwise) position.
2. Connect the POSITIVE (+) and NEGATIVE (-) OUTPUT TERMINALS to a piece of metal, separated by approximately three feet (one meter).
3. Connect the clamp-on amperage meter or equivalent to the output loop between the POSITIVE (+) and NEGATIVE (-) OUTPUT TERMINALS.
4. Place the power supply MAIN CIRCUIT BREAKER on the rear of the unit to the ON position. After five (5) seconds, the amperage meter will indicate approximately 5 Amps.
5. Slowly turn the AMPERAGE control clockwise to the maximum of the power supply, then counterclockwise, back to 5 Amps as the control returns to its minimum position. The amperage meter should indicate a continuous range of Amperes between the 5 Amps minimum and the 300 Amps maximum of the power supply.
6. Place the power supply MAIN CIRCUIT BREAKER on the rear of the unit to the OFF position.
7. Remove the dead short between the OUTPUT TERMINALS.

This completes the output load test. If the results of any step differ from those above, then refer to the various test procedures in this section to isolate the problem. If the results are as expected, then the power supply is giving the proper output.

6.07 LIFT START Circuit Test

This test verifies proper operation of the LIFT START circuit. A clamp-type amperage meter or equivalent meter capable of reading approximately 20A full-scale, and a digital voltmeter capable of indicating 20VDC full-scale will be needed for this test.

CAUTION

Before performing any portion of the procedure below, make certain the unit is placed in the initial setup condition previously described, (page 6-2).

1. Make sure the MAIN CIRCUIT BREAKER (MCB) is turned OFF.
2. Set the PROCESS SELECTOR switch to LIFT START TIG mode.
3. Connect a digital voltmeter between the POSITIVE (+) and NEGATIVE (-) OUTPUT TERMINALS of the unit. Set the meter to indicate Volts DC.
4. Connect a jumper between pins 2 and 3 of the REMOTE 8 connector, or if a remote contactor is connected, close it. (Ensure that the remote device is not faulty.)
5. Place the power supply MCB on the rear of the unit to the ON position. After five (5) seconds, the voltmeter will indicate approximately 6 volts open circuit.
6. Turn off the power supply MCB.
7. Connect the POSITIVE (+) and NEGATIVE (-) OUTPUT TERMINALS to a piece of metal, separated by approximately three feet (one meter).
8. Connect a jumper between pins 2 and 3 of the REMOTE 8 connector, or if a remote contactor is connected, close it.
9. Place the power supply MCB on the rear of the unit to the ON position. After five (5) seconds, the voltmeter will indicate approximately 1 volt.
10. Turn off the power supply MCB.
11. Connect the clamp on the amperage meter or equivalent to the output loop between the POSITIVE (+) and NEGATIVE (-) OUTPUT TERMINALS.

12. Place the power supply MCB on the rear of the unit to the ON position. After five (5) seconds, the amperage meter will indicate approximately 17Amps.
13. Turn off the power supply MCB.
14. Remove the loop connected between the POSITIVE (+) and NEGATIVE (-) OUTPUT TERMINALS.

This completes the LIFT START circuit test. If the results of any step differ from those above, the Main Circuit Board should be replaced.

6.08 High Frequency (HF) START Circuit Test

This test verifies the operation of the HF START circuit.

CAUTION

Before performing any portion of the procedure below, make certain the unit is placed in the initial setup condition previously described (page 6-2).

1. Make sure the MAIN CIRCUIT BREAKER (MCB) is turned OFF.
2. Set the PROCESS SELECTOR switch to HF START mode.
3. Connect TIG torch and shielding gas.
4. Connect a remote control or jumper between pins 2 and 3 of the REMOTE 8 receptacle for contactor closure. If a remote switch is installed, close it.
5. Place the power supply MCB on the rear of the unit to the ON position. After PRE-FLOW of 150 ms, the HF START circuit will turn ON. If the torch is brought to within 3/8" to 1/2" of the work, lead arc transfer will occur. After arc transfer, the HF START circuit will turn OFF.
6. Remove the jumper, or open the remote control switch if installed. The arc turns OFF.
7. Turn off the power supply MCB.

This completes the HF START circuit test. If the results of any step differ from those above, perform the HF Unit test, further in Advanced Troubleshooting. If the HF Unit is good, replace the Main Circuit Board.

6.09 Subsystem Test Preparation

The following initial conditions must be met prior to starting any of the procedures in the subsystem tests.

1. Set the PROCESS SELECTOR switch to STICK mode.
2. Set the OUTPUT MODE to DC OUTPUT position.
3. Set the AMPERAGE control to its minimum (fully counterclockwise) position.
4. No connection should be made to the remote receptacle(s).
5. Connect the appropriate input voltage. (Check the data tag on the rear of the power supply for the proper input voltage.)

NOTE

Operate at ALL input voltages as noted on the nameplate on the rear panel when testing the power supply.

6. Close primary power source wall disconnect switch or circuit breaker.
7. Place power supply MAIN CIRCUIT BREAKER (MCB) on rear of unit in the ON position.

WARNING

Dangerous voltage and power levels are present inside this unit. Be sure the operator is equipped with proper gloves, clothing, eye and ear protection. Make sure no part of the operator's body comes into contact with the workpiece or any internal components while the unit is activated.

This section provides specific procedures for verifying the operation and replacement of each subsystem within the power supply. Before undertaking any of these procedures, eliminate the obvious first - visually inspect the suspect subsystem for physical damage, overheating, and loose connections.

6.10 Main Circuit Breaker (MCB) Replacement Procedure

WARNING

Disconnect primary power at the source before performing this procedure.

Refer to figure 6-3 on opposite page.

To remove the MAIN CIRCUIT BREAKER:

1. Remove the four screws from the rear panel that secure the MAIN CIRCUIT BREAKER assembly to the rear panel.
2. Remove the input power leads and output power leads marked R and S in figures 6-4 and 6-5 from the MCB terminals. Remove the MCB from the metal shield. If the metal shield must be removed, note that it is connected to a GREEN ground lead.

To replace the MCB, reverse the above steps, replacing the input and output leads in the same matching positions. Refer to figure 6-4 or 6-5.

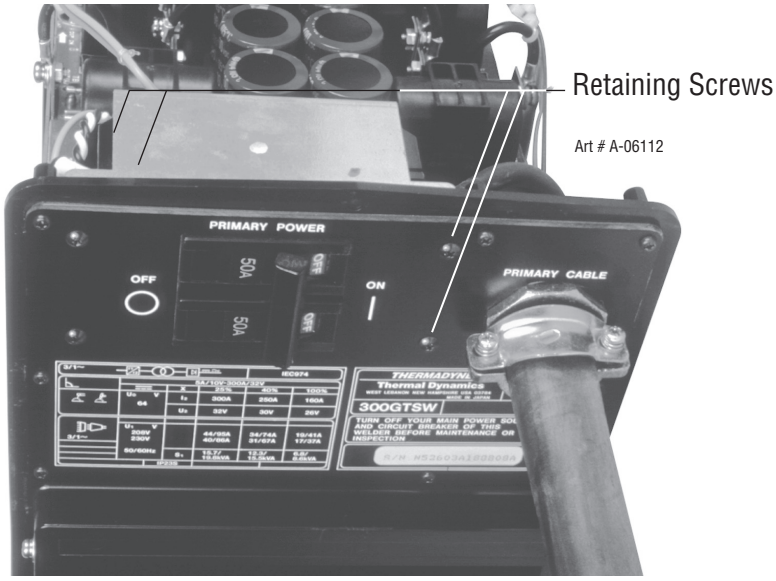


Figure 6-3: Main Circuit Breaker

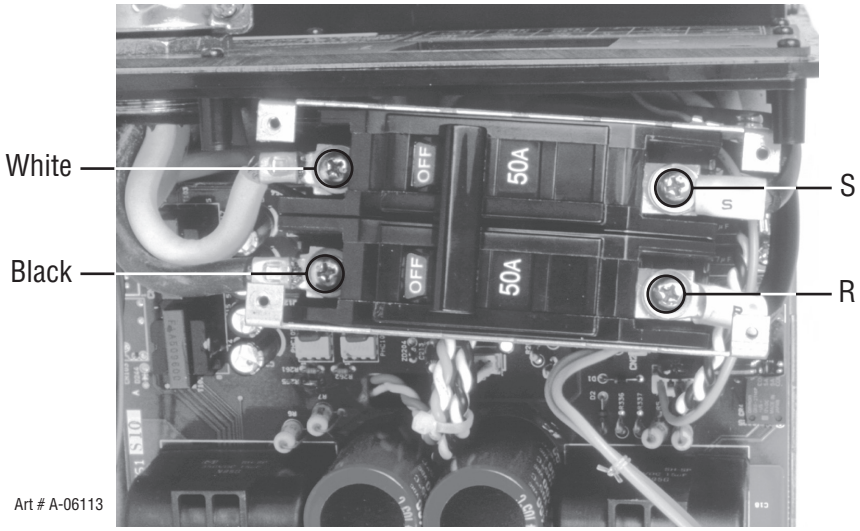


Figure 6-4: Main Circuit Breaker connections - single phase

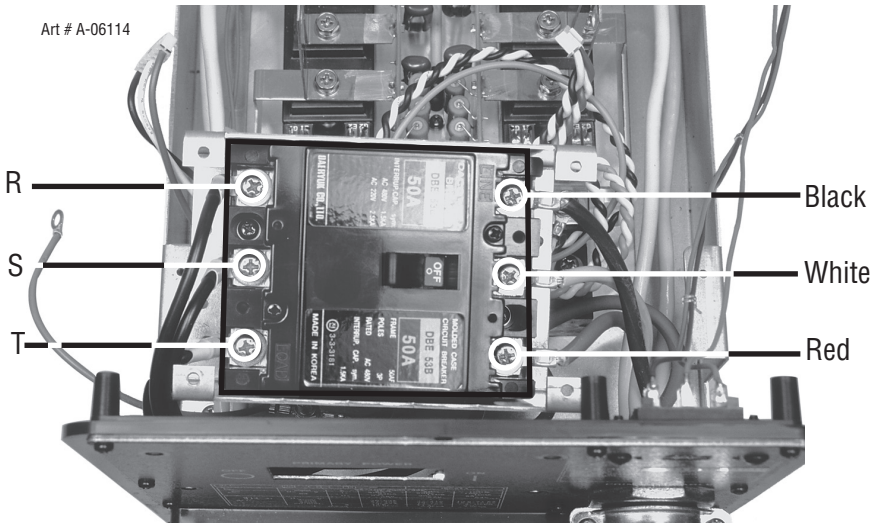


Figure 6-5: Main Circuit Breaker connection - three phase

6.11 Main PCB1 Gate Drive Enable Signal Test

The gate drive signals are 21.3kHz square wave signals, with an OFF level of -4VDC for 26µs, and the ON level of +11VDC for 21µs. There is a 2.5µs dead time before and after the ON time of each channel before the other goes through its OFF/ON transition. Refer to figure 6-7.

1. Apply power to the unit and turn the MAIN CIRCUIT BREAKER (MCB) ON.
2. Using an oscilloscope at the CN8 connector on the Main Circuit Board (PCB1), measure the voltage between Q1 signal pairs:

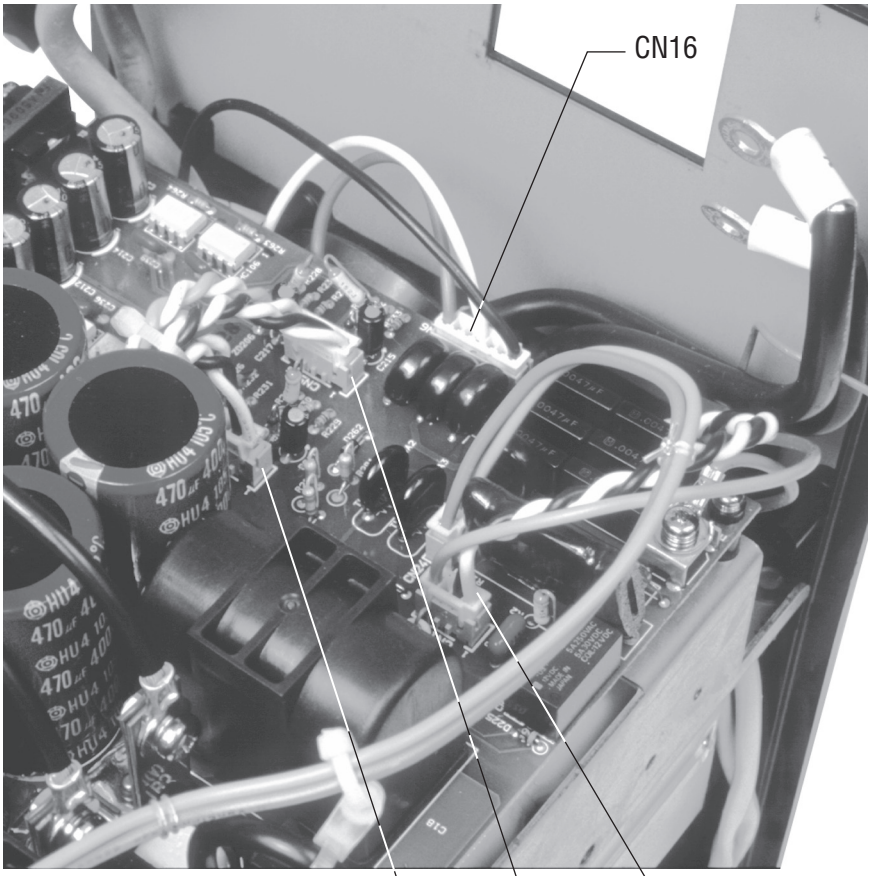
   Pin 1 and 2

   Pin 4 and 5
3. Using an oscilloscope at the CN9 connector on the Main Circuit Board (PCB1), measure the voltage between Q2 signal pairs:

   Pin 1 and 2

   Pin 4 and 5
4. Using a voltmeter, measure the voltage between signal pins 1 and 2 and pins 4 and 5 at connector CN8. The voltage between each pair of pins should be +5VDC. Switch the PROCESS SELECTOR switch to the TIG LIFT START position. The voltage between both pair of pins should drop to -4VDC.
5. Return the PROCESS SELECTOR switch to the STICK position.
6. Using a voltmeter, measure the voltage between signal pins 1 and 2 and pins 4 and 5 at connector CN9. The voltage between each pair of pins should be +5VDC. Switch the PROCESS SELECTOR switch to the TIG LIFT START position. The voltage between both pair of pins should drop to -4VDC.

If the results of any of these tests are incorrect, replace the Main Circuit Board (PCB1).



Art # A-06115

Figure 6-6: Main Circuit Board

Art # A-06116

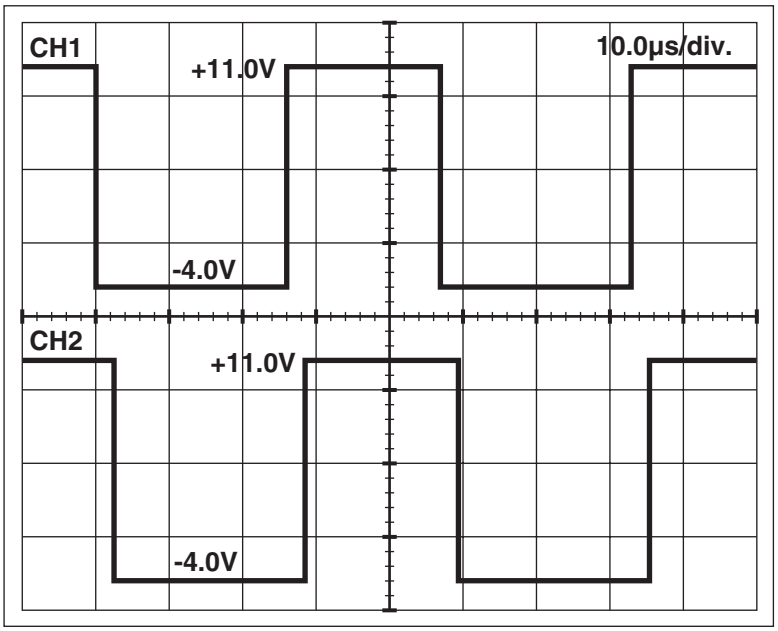


Figure 6-7: Gate drive enable waveform

6.12 Lift Start Test

1. Disconnect primary power at the source. Make sure the MAIN CIRCUIT BREAKER is in the OFF position.
2. Measure the continuity between the front panel NEGATIVE (-) OUTPUT TERMINAL to CN5-3 on the Main Circuit Board (PCB1), and from the front panel POSITIVE (+) OUTPUT TERMINAL to CN5-1 on the Main Circuit Board (PCB1). Both should be zero Ohms. Replace wire if continuity is broken.
3. Reapply power to the unit by turning the MAIN CIRCUIT BREAKER to the ON position.
4. Disconnect connectors CN8 and CN9 on the Main Circuit Board (PCB1). Measure the voltage between CN22-5 and CN22-4 for 0VDC. Install a jumper between the POSITIVE (+) and NEGATIVE (-) OUTPUT TERMINALS on the front panel. The voltage between CN22-5 and CN22-4 should increase to +5VDC.

If the voltage does not increase in step 4 above, replace the Main Circuit Board (PCB1).

6.13 Gas Control Test

Disconnect the remote control device from the REMOTE 8 receptacle.

1. Measure for +24VDC between pins 3 and 4 on CN2 on the Main Circuit Board (PCB1). Replace the Main Circuit Board (PCB1) if the voltage is low or not present.
2. Measure for +24VDC between CN7-1 and CN7-2. If no voltage is present, check and replace wires between CN7-1 (PCB4) and CN4-1 (PCB2) or between CN7-2 (PCB4) and CN4-2 (PCB2).

With a remote control device connected to the REMOTE 8 receptacle and contact closure between pins 2 and 3, measure the voltage between the gas solenoid valve terminals. If the voltage is 24VDC and the solenoid does not operate, replace the solenoid valve. If the voltage is low or not present, replace the Main Circuit Board (PCB1). There is a 150ms delay built into the circuit before the voltage will be there.

6.14 High Frequency Test

1. Place the PROCESS SELECTOR Switch in the STICK position.
2. Jumper pins 1 and 5 on the CN7 plug. Apply power to the unit.
3. If the high frequency buzz is heard coming from the HF Unit, the Main Circuit Board (PCB1) should be replaced. If no sound is heard coming from the HF Unit, the HF Unit should be replaced.

6.15 Main Circuit Board (PCB1) Replacement Procedure

To remove the Main Circuit Board:

1. Locate connectors CN7, CN8 and CN9 at the top edge of the Front Panel Circuit Board.
2. Gently pull up on the retainer bar on each side of each connector to release the ribbon cable in the connectors.
3. Remove the ribbon cable by gently pulling straight up on the ribbon cable.

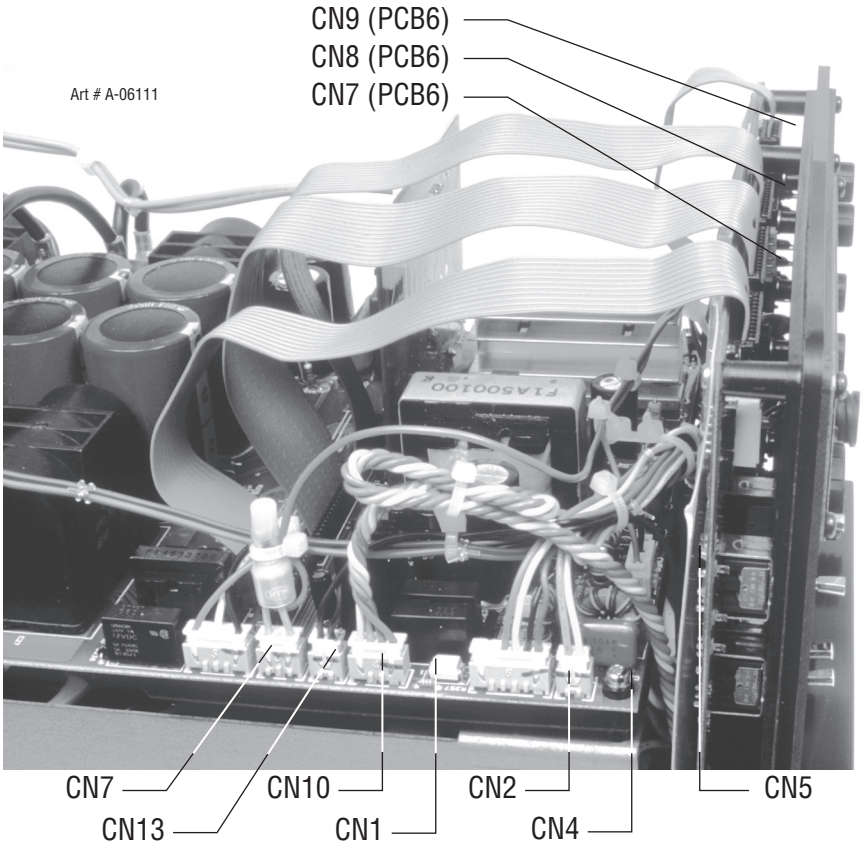


Figure 6-8: Power supply voltage connector locations.

4. On the Main Circuit Board, remove the screw from TB12 and remove the GREEN ground wire lug from the terminal (figure 6-9).

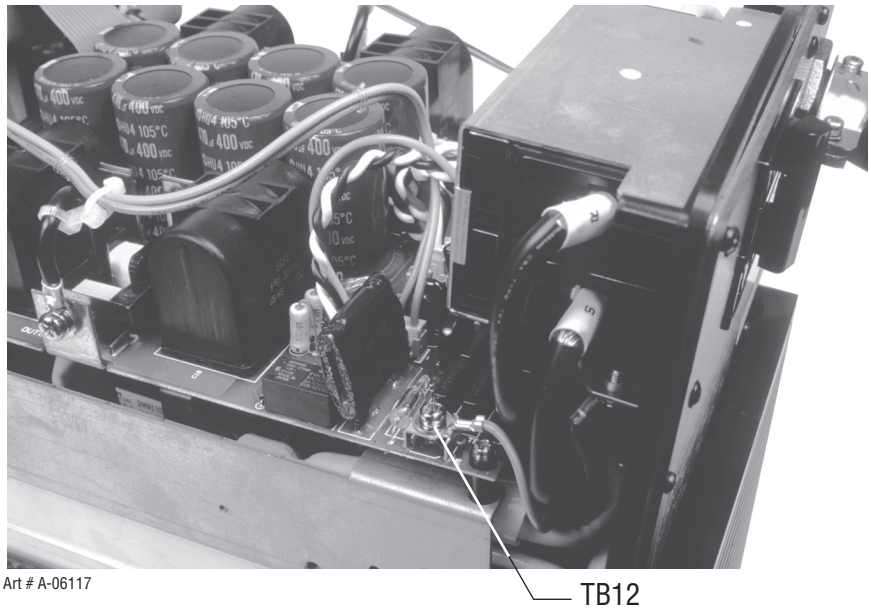


Figure 6-9: Location of TB12 on main circuit board

5. Remove all connectors from the left side and front of the Main Circuit Board — CN1 , CN2 , CN4, CN5 , CN7, CN10, CN13 and CN26 (not shown).

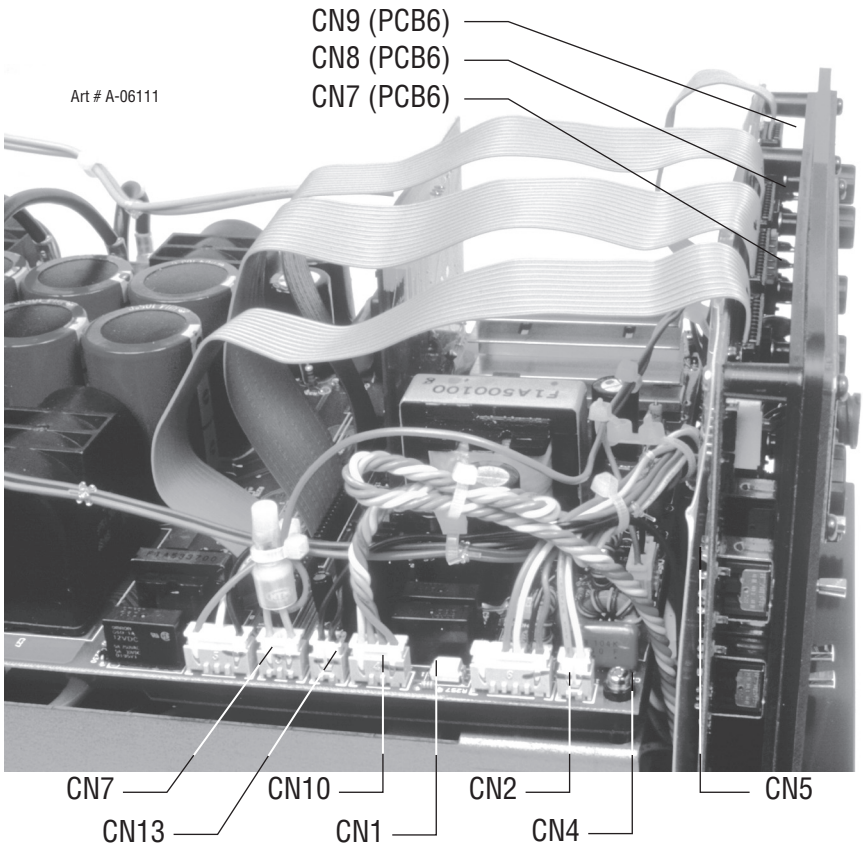


Figure 6-10: Connectors to be removed from left side and front of main circuit board

6. Cut any cable ties securing wire harnesses to TB1 or TB2 leads.
7. Move the wiring harness aside, clear of the Main Circuit Board.

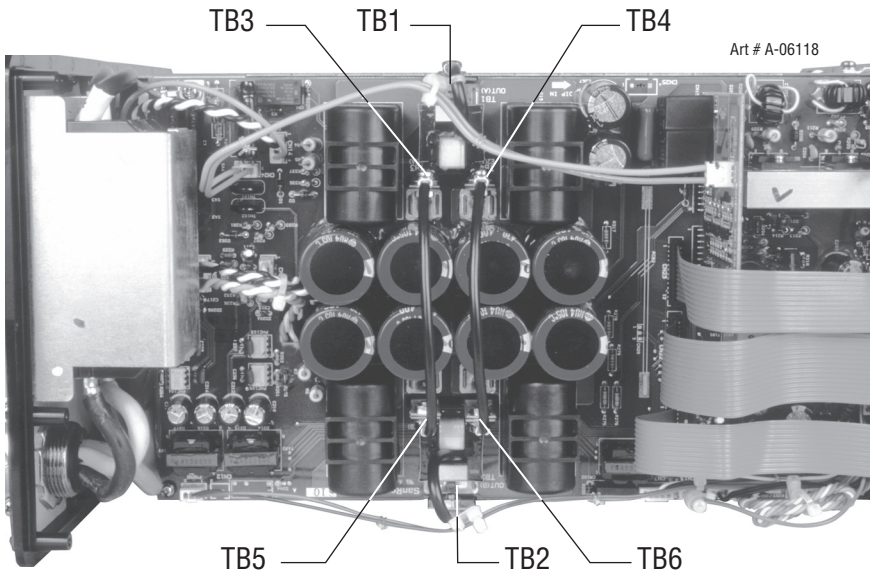


Figure 6-11: Location of TB1 through TB6 on main circuit board

8. Remove the screws securing the MAIN CIRCUIT BREAKER to the rear panel.
9. Remove connectors CN6, CN8, CN9, and CN14 from the rear of the Main Circuit Board.
10. Remove screws, associated hardware and wire lugs from TB1 through TB6. Straighten the lugged wires that were removed from TB1 and TB2 so they stand vertically. This will allow the wires to pass through the current sensors when the Main Circuit Board is lifted away from the chassis in a later step.

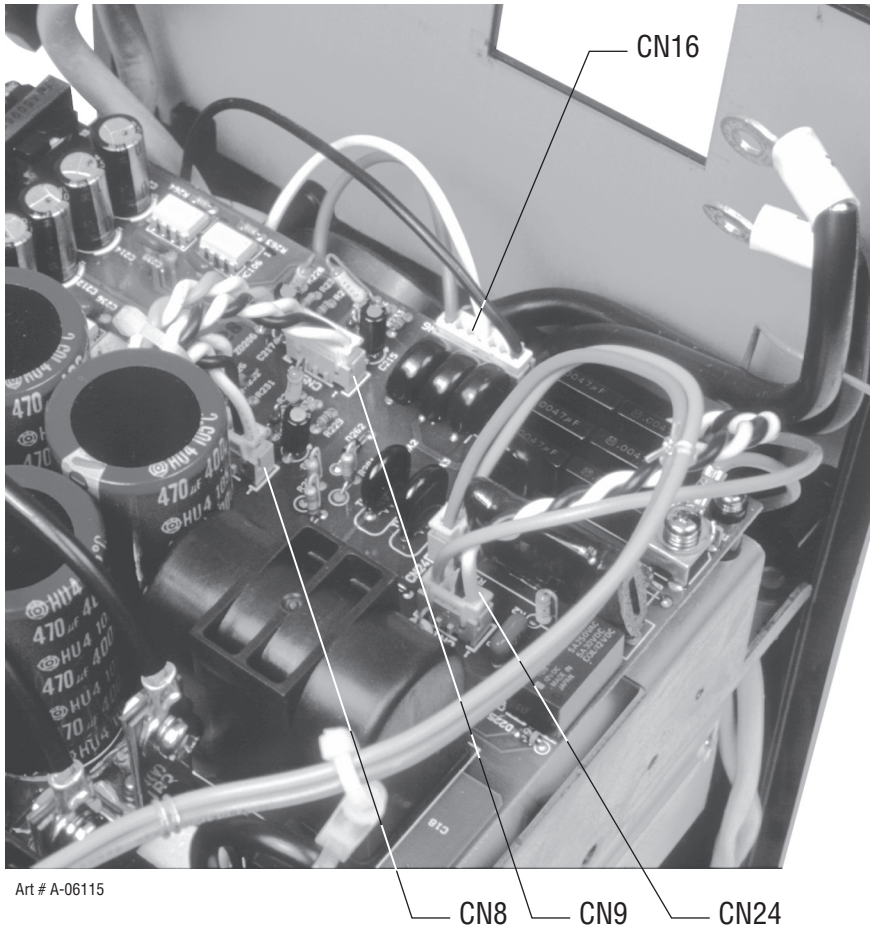


Figure 6-12: Connectors to be removed from rear end of main circuit board

11. Cut the cable tie securing the CN18-to-CN24 ORANGE/GRAY wire pair to the BLACK lead attached to TB1.
12. Remove the four (4) mounting screws from the corners of the Main Circuit Board.

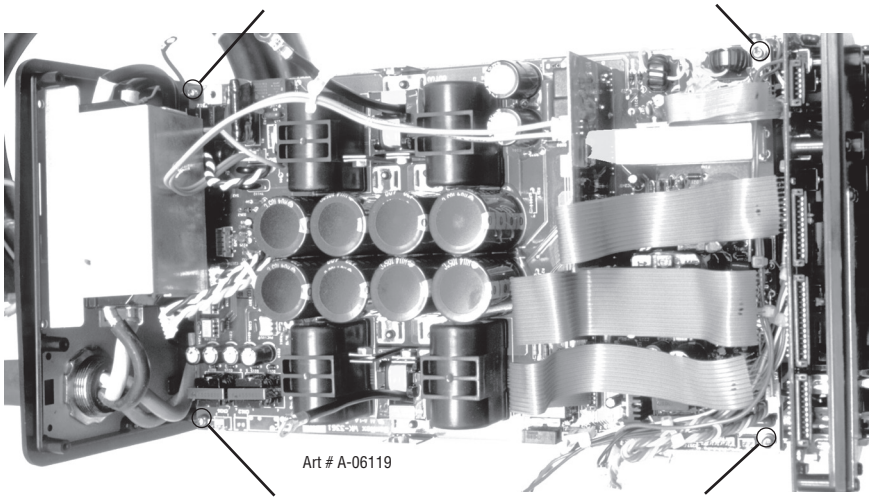


Figure 6-13: Main circuit board retaining screws

13. Lift the Main Circuit Board straight up, passing the lugged wires removed from TB1 and TB2 through the current sensors.
14. As you remove the Main Circuit Board, pass connectors CN8 and CN9 through the hole in the board.
15. Continue to pull the Main Circuit Board straight up and away from the chassis.

To replace the Main Circuit Board:

1. Hold the Main Circuit Board over the chassis, oriented so the three ribbon cables are toward the front panel of the power supply.
2. As you lower the Main Circuit Board onto the chassis, pass the lugged wires that will attach to TB1 and TB2 through the current sensors, and connectors CN8 and CN9 through the hole in the board.
3. As you lower the Main Circuit Board onto the chassis, replace the connectors on the rear end of the board at locations CN5, CN8, CN9, and CN14.
4. Continue lowering the board so the vertical bus bars pass through the slots in the boards, and line up with TB3/4 and TB5/6. The board is properly seated when the holes in the vertical bus bar and the terminals TB1-6 line up, the board is seated on the black plastic spacers in the corners of the board, and there is no interference with wire harnesses.
5. Carefully pull up through the current sensors the excess lead length of the two lugged wires that will connect to TB1 and TB2.
6. Replace the hardware to secure the lugged wires to TB1 through TB6. The lugged wires that connect to TB1 and TB2 must be bent over in a loop.
7. Insert the screws and washers into the four corners of the Main Circuit Board. Do not tighten until all four screws are started in their holes.
8. Replace all connectors on the Main Circuit Board and the MAIN CIRCUIT BREAKER on the rear panel.

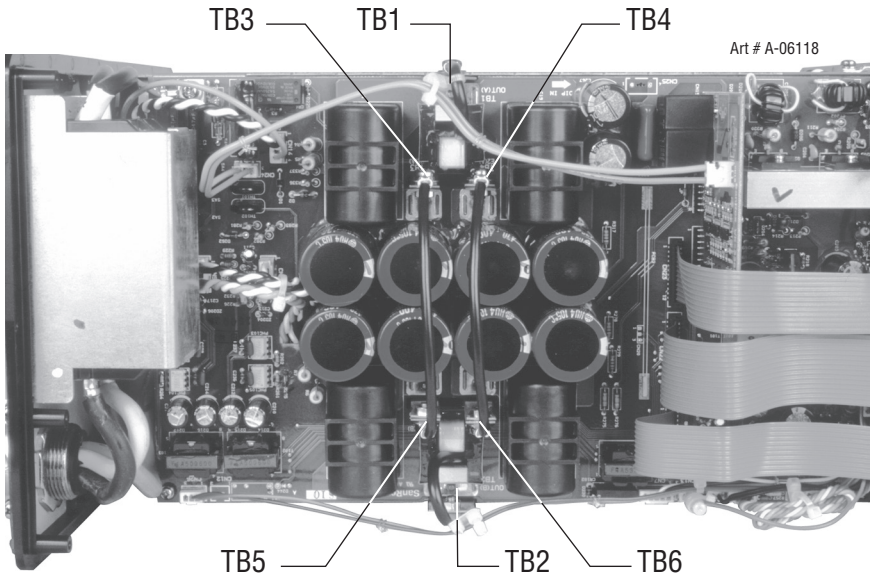


Figure 6-14: TB1 through TB6 reconnections

6.16 Gaining Access to Front Panel Circuit Board (PCB6) WK-3988

To gain access to the test points on the Front Panel Circuit Board, it is necessary to remove the front panel of the power supply unit. To accomplish this, do the following:

1. Locate and remove the six screws securing the Front Panel to the front of the power supply. Allow the front panel to drop down to allow free access to the test points on the Front Panel Circuit Board (PCB6).

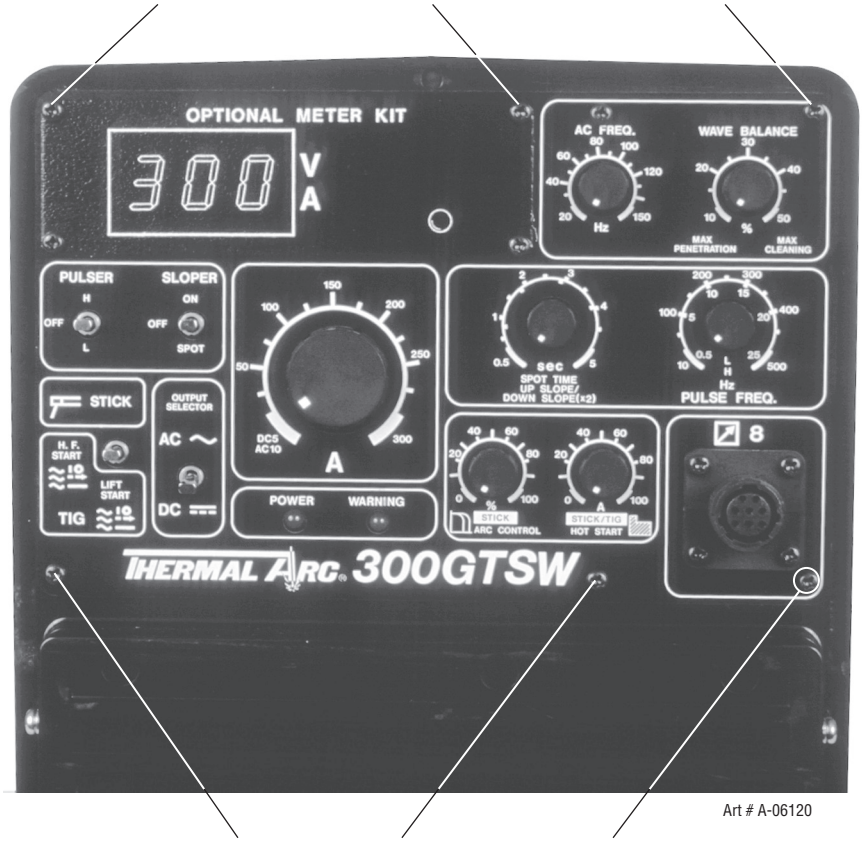


Figure 6-15: Front panel retaining screws

6.17 Front Panel PCB6 (WK-3988) Test Point Voltages

The test point voltages on the Front Panel Circuit Board should be verified as follows.

1. Set up the contactor closure circuit by installing a jumper between pins 2 and 3 of the REMOTE 8 receptacle;
2. Measure the voltage between test points TP8 and TP0 to be 12VDC.
3. Measure the voltage between test points TP4 and TP0 to be 5VDC.
4. Measure the voltage between test points TP5 and TP0 to be 5VDC.
5. Set up the contactor closure circuit by removing the jumper from the REMOTE 8 receptacle;
6. Measure the voltage between test points TP8 and TP0 to be 3.5VDC.
7. Measure the voltage between test points TP4 and TP0 to be 0VDC.
8. Measure the voltage between test points TP5 and TP0 to be 0VDC.
9. Measure between TP0 and the test points below to verify the voltages given:

TP0	0V	Circuit Common
TP1	+5VDC	Regulated voltage of control circuit
TP2	+12VDC	Regulated voltage of control circuit
TP3	-12VDC	Regulated voltage of control circuit
TP6	+4VDC	Regulated voltage of control circuit

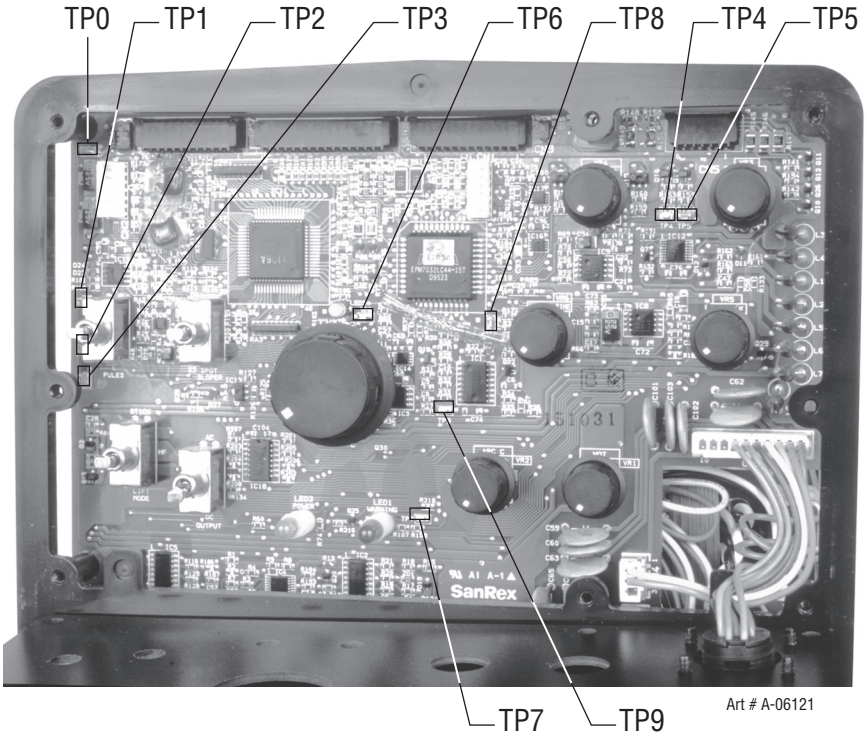


Figure 6-16: Front panel voltage test points

6.18 Input Power Selector Switch Test

1. Using an ohmmeter check continuity from CN13 Pin1 and Pin 3 with the input voltage selector switch in the 208/230 volt position.
2. Using an ohmmeter check continuity from CN13 Pin 2 and Pin 3 with the input voltage selector switch in the 460 volt position.
3. If any of the tests fail replace easylink switch on rear panel.

6.19 Front Panel Circuit Board (PCB6) Replacement Procedure

Refer to Figures 6-17 and 6-18.

To remove the Front Panel Circuit Board:

1. Remove the Main Circuit Board, referring to page 6-13.
2. Locate and remove five (5) screws from the Front Panel Circuit Board/Shield securing them to the inside of the front panel of the unit.

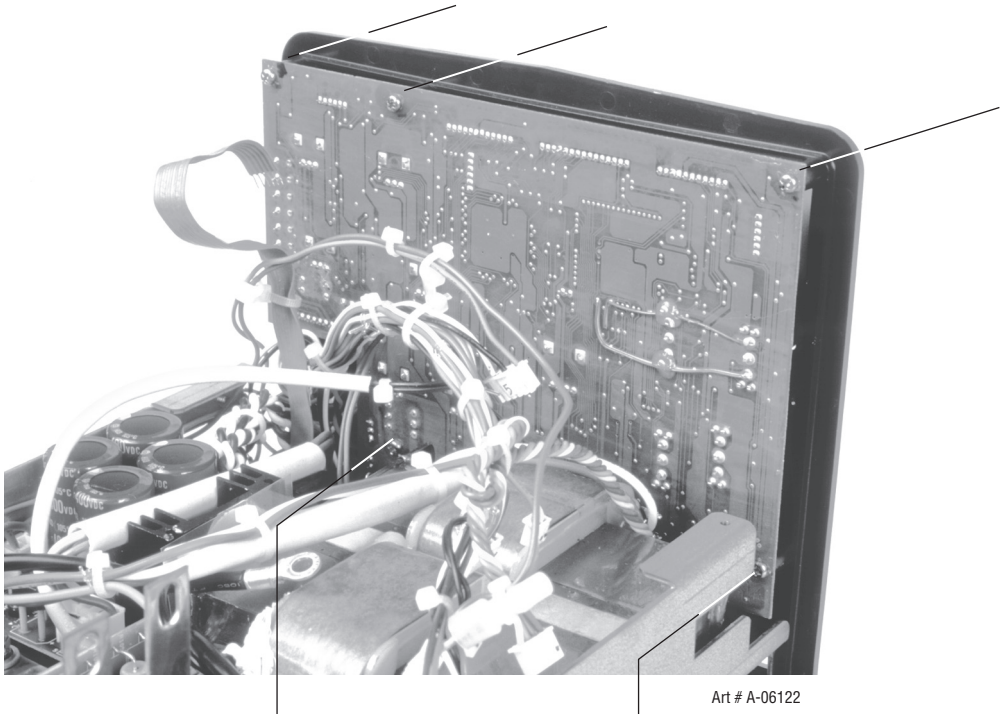


Figure 6-17: Front panel circuit board retaining screws

3. Pull the Front Panel Circuit Board back toward the rear of the power supply and then up to free the controls from their respective holes in the front panel. Fold the Front Panel Circuit Board down to expose the component side of the board.
4. Remove all connectors from the Front Panel Circuit Board.

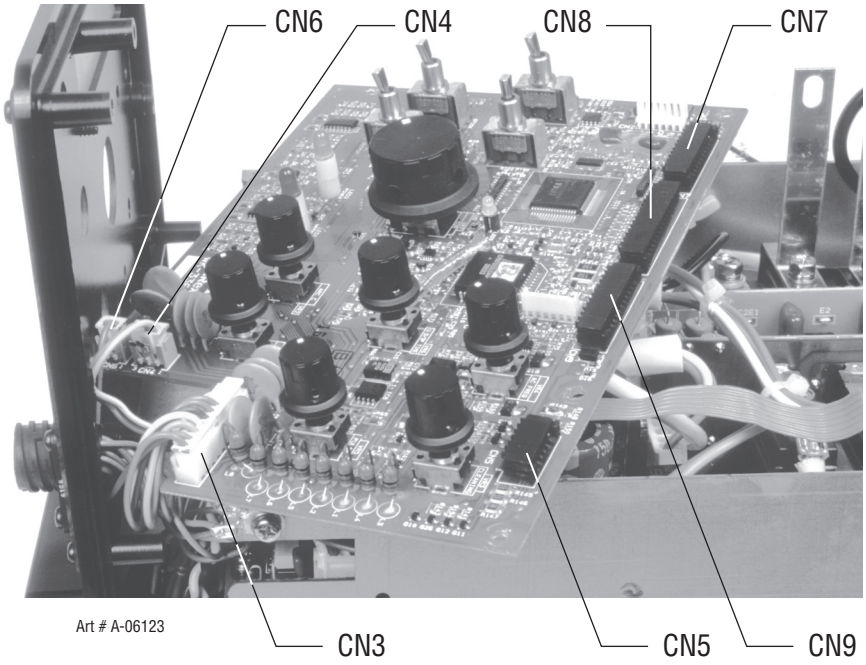


Figure 6-18: Component side of front panel circuit board

5. Remove the Front Panel Circuit Board from the power supply.

To replace the Front Panel Circuit Board, reverse the removal steps.

6.20 Current Transformer Test Procedure

1. Disconnect connector CN1 from the Main Circuit Board (PCB1).
2. With an Ohmmeter set the Rx10 scale, measure between the pins on the CN1 plug as follows:

   Pin 4 (YELLOW) and Pin 1 (BROWN) > 120KOhms

   Pin 4 (YELLOW) and Pin 2 (RED) @ 20KOhms

6.21 Current Transformer Replacement Procedure

Refer to figure 6-19.

To remove the Current Transformer (CT):

1. Remove the Output Inductor Assembly per section 6.37on page 6-42.
2. Remove hardware from Output Bus Bar/IGBT Inverter (Q3/Q4) Bus Bar junction.
3. Remove the bolt and associated hardware from the inside of the POSITIVE (+) OUTPUT TERMINAL.
4. Remove the connector with the RED/YELLOW/ ORANGE/BROWN twisted wiring harness from the CT.
5. Remove the Output Bus Bar/CT.
6. At the end removed from the POSITIVE (+) OUTPUT TERMINAL, bend the Output Bus Bar sufficiently to allow the CT to slide off the end of the bus bar.

To replace the Current Transformer:

1. Slide the new CT onto the Output Bus Bar, in the same orientation as the one removed.
2. Return the end of the Output Bus Bar to a right angle (90° bend).

The next step makes it much easier to complete the replacement due to interference with the Coupling Coil.

3. On IGBT Inverter Q3/Q4, remove the two screws securing the bus bar that was attached to the Output Bus Bar/CT Assembly.
4. Replace the hardware to joint the bus bar removed from Q3/Q4 and the Output Bus Bar/CT Assembly. Finger tighten.
5. Replace the bus bar onto Q3/Q4. Securing the two screws through the bus bar into Q3/Q4 may require using a screwdriver at an angle, or a right-angle screwdriver if available.
6. Reverse the remaining removal steps.

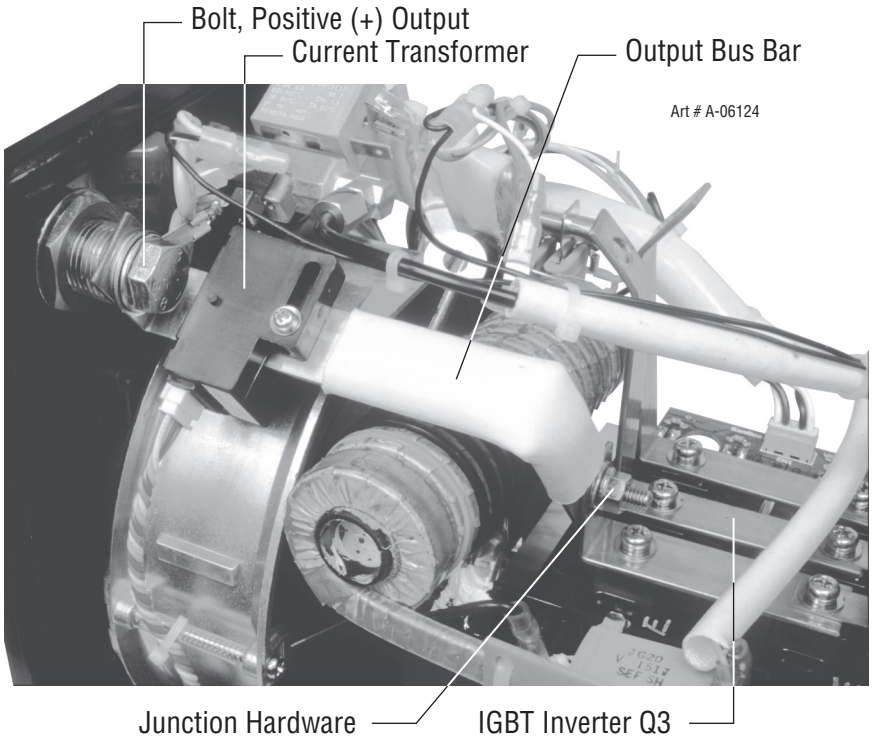


Figure 6-19: Current transformer and output bus bar

6.22 Power Control Assembly

The Power Control Assembly (PCA) consists of input diode (D1), IGBT Inverters (Q1-Q4), output diodes (D2-D5), heat sinks, main and auxiliary transformers, output inductors and high frequency coupling coil. Perform a careful inspection of all components of the PCA first. Failure may be identified by burned insulation or other physical symptoms. If there are no signs of physical damage, conduct the procedure that follows.

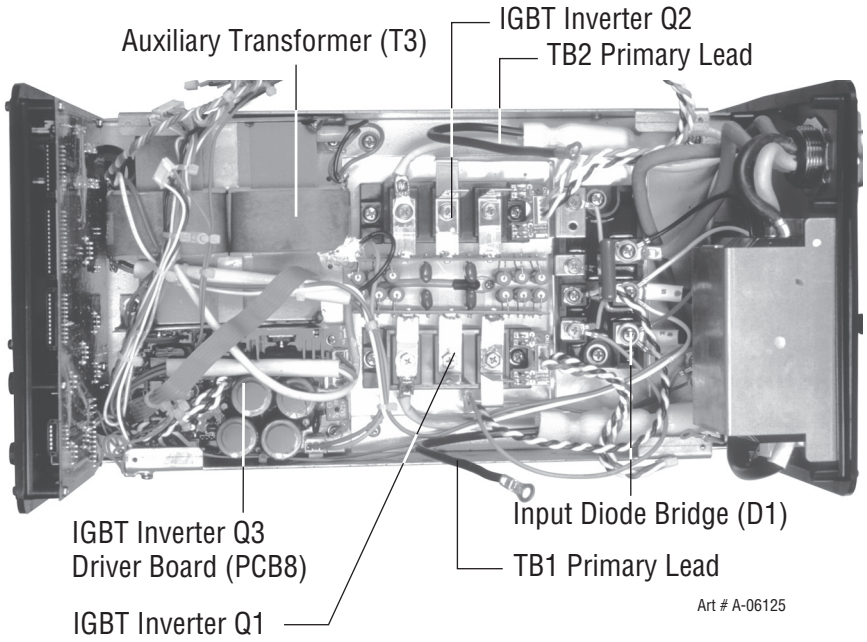


Figure 6-20: Top of power control assembly (main circuit board removed)

6.23 Power Control Assembly (PCA) Test Procedures

WARNING

Disconnect primary power at the source before performing these procedures.

This procedure requires a digital Volt/Ohm meter that has a diode test scale. This procedure will give a general indication of the condition of the PCA components; a more conclusive test requires specialized equipment. Therefore, even if the results of these procedures check out as good, one or more components may still be faulty. If there is any doubt, replace the faulty PCA component. It is assumed that you are familiar with diode testing basics. If not, please refer to the Appendix.

6.24 PCA Input Diode Bridge (D1) Test Procedure

Refer to figure 6-21

1. Select the Ohms scale on the digital meter.
2. Check CN14 on Main Circuit Board between pins 1 and 2. The resistance should read 44 Ohms.
3. Select the diode test setting on the digital meter.
4. Check the diodes between the following:

   MAIN CIRCUIT BREAKER (MCB) wire R, and TB6 on the Main Circuit Board;

   MCB wire S, and TB6 on the Main Circuit Board;

   MCB wire T, and TB6 on the Main Circuit Board;

   MCB wire R, and CN14 pin 4 on the Main Circuit Board;

   MCB wire S, and CN14 pin 4 on the Main Circuit Board;

   MCB wire T, and CN14 pin 4 on the Main Circuit Board

6.25 PCA Input Diode Bridge (D1) Replacement Procedure

Refer to figure 6-21.

To remove the Input Diode Bridge (D1), do the following:

1. Remove the Main Circuit Board (PCB1) per page 6-13.
2. Remove the input power and sensing lugged wires from the input terminals R and two RED, S and two WHITE, RED input line and BLACK.
3. Remove screws from all terminals with lugged wires, and the corner bus bar.
4. Remove the two screws that secure the Input Diode Bridge to the main chassis frame.
5. Slide the Bridge out from under the bus bar.

To replace the Input Diode Bridge (D1), do the following:

1. Spread a light coating of thermal compound on the bottom surface of the Bridge.
2. Slide the Bridge under the bus bar.
3. Reverse the remaining removal steps above. When replacing the screws that secure the Bridge to the chassis, make sure both screws are started before tightening them.

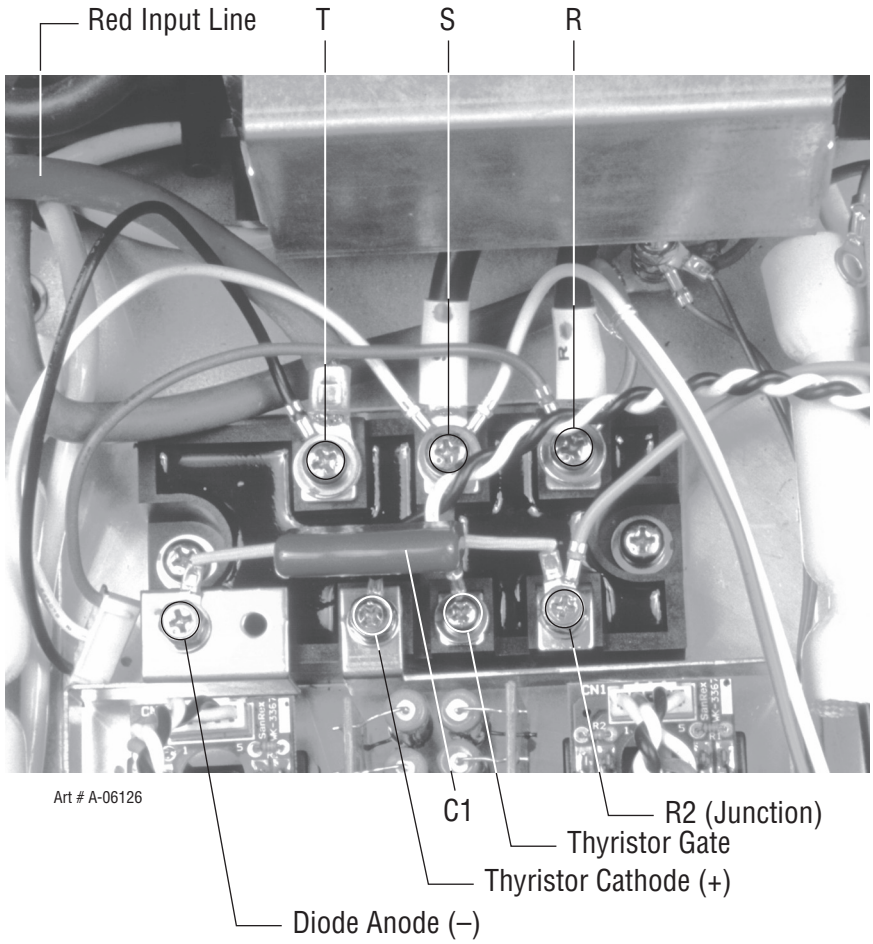


Figure 6-21: Power control assembly - input diode bridge (D1)

6.26 PCA IGBT Inverter Test Procedure

Refer to figures 6-22 and 6-23.

The IGBT Inverter sections contain four IGBT transistor/diode assemblies, Q1, Q2, Q3 and Q4. These can be tested with the power OFF to verify their proper function.

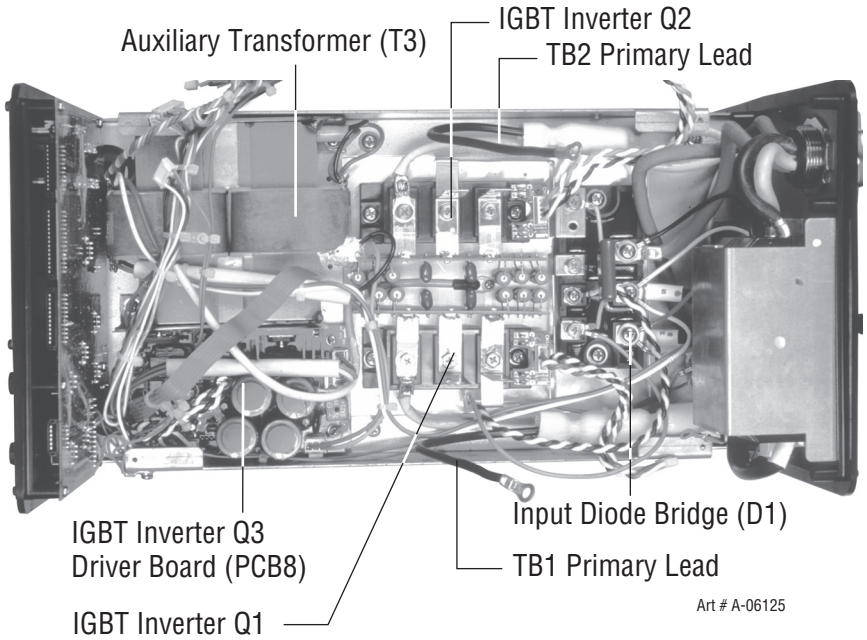


Figure 6-22: Top of power control assembly

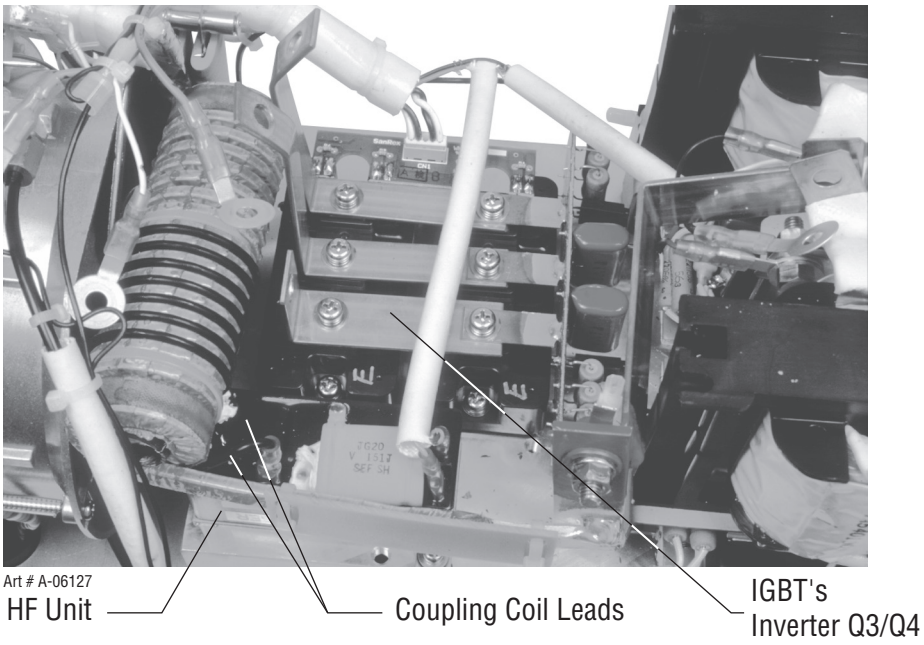


Figure 6-23: Power control assembly - IGBT inverters

Power OFF Test Procedure

1. Set the diode test scale on the digital meter.
2. For Q1, check the diodes between:

   TB3 and TB1

   TB4 and TB1
3. For Q2, check the diodes between:

   TB5 and TB2

   TB6 and TB2

   A. To check the gate drive resistances for Q1 and Q2 unplug CN8 and CN9 from the MAIN PCB. Should measure 2.18kW.

   CN8/CN9 plug PIN 1 to PIN 2

   CN8/CN9 plug PIN 4 to PIN 5
4. For Q3/Q4, check the diodes between:

   A quick check can be made across the POSITIVE and NEGATIVE output terminals.

   Set the meter to ohms and check the resistance across the weld terminals and the reading should be 2.5kW.
5. For Q3/Q4 check the diodes between;

   Brown wire on the filter choke to the POSITIVE (+) OUTPUT TERMINAL.

   Gray wire on the filter choke to the POSITIVE (+) OUTPUT TERMINAL.
6. If a component on the Q3,Q4 gate board (PCB9) is damaged then the Driver PCB (PCB8) should be checked.

   A. Disconnect CN2 from PCB8.

   B. Check the gate resistance on PCB9 between E1 to G1 and E2 to G2. Reading should be 1.1kW.

   C. Check gate drive on PCB8 at CN2 between CN2-1 to CN2-2 and CN2-4 to CN2-5. Reading should be 1kW.

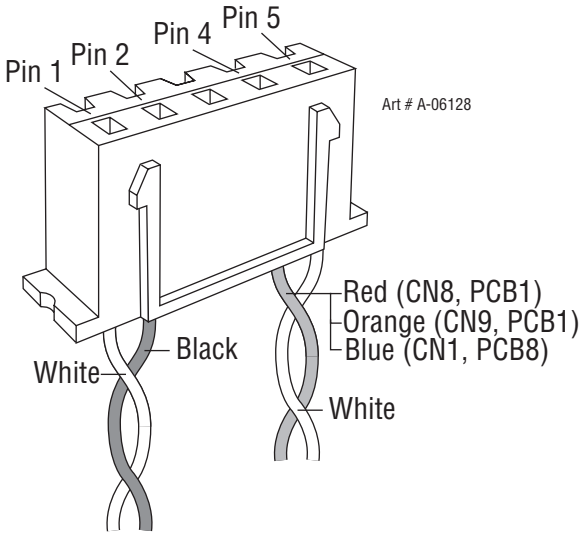


Figure 6-24: Plug orientation for IGBT inverter power OFF test

For Q3/Q4, refer to figure 6-25, then:

7. With the digital meter on the diode test scale, measure between bus bars A-B and B-C.
8. On PCB1 mounted to Q3/Q4 there are 4 sets of points E1G1, E2G2, E3G3, E4G4. Check each of these with a meter on diode scale. A short is a bad indication. If a short is detected remove the bus bars and test individually to determine which is bad Q3 or Q4.

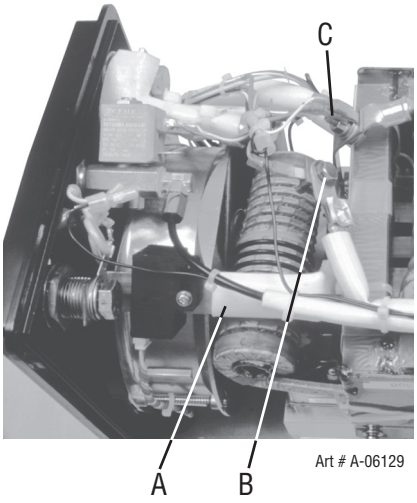


Figure 6-25: Q3/Q4 IGBT inverter measurement points

6.27 PCA IGBT Inverters Q1 and Q2 Replacement Procedure

Refer to figure 6-26.

To remove either of the IGBT Inverters Q1 or Q2, do the following:

Q1 is located on the right side of the unit Q2 on the left as you face the front panel of the power supply.

1. Remove the Main Circuit Board per page 29.
2. Remove the T1A or T2A heavy lugged lead, depending on which Inverter you are removing. Replace this screw if the printed circuit board is to remain with the IGBT Inverter being removed (PCB4 on Q1 or PCB5 on Q2).
3. Remove the screw from the terminal with the double bus bar. Again, replace this screw if the printed circuit board is to remain with the Inverter being removed (PCB4 on Q1 or PCB5 on Q2). Be sure the screw goes through only the hole in the bus bar connected to the printed circuit board (PCB4 or PCB5).
4. Remove the two (2) screws securing the Inverter to the main chassis frame.

To replace either Inverter (Q1 or Q2), do the following:

1. Spread a light coating of thermal compound on the bottom surface of the Inverter.
2. Slide the Inverter in place under the bus bar coming from the Input Diode Bridge.
3. Reverse the remaining removal steps above. When replacing the screws that secure the Inverter to the chassis, make sure both screws are started before tightening them.

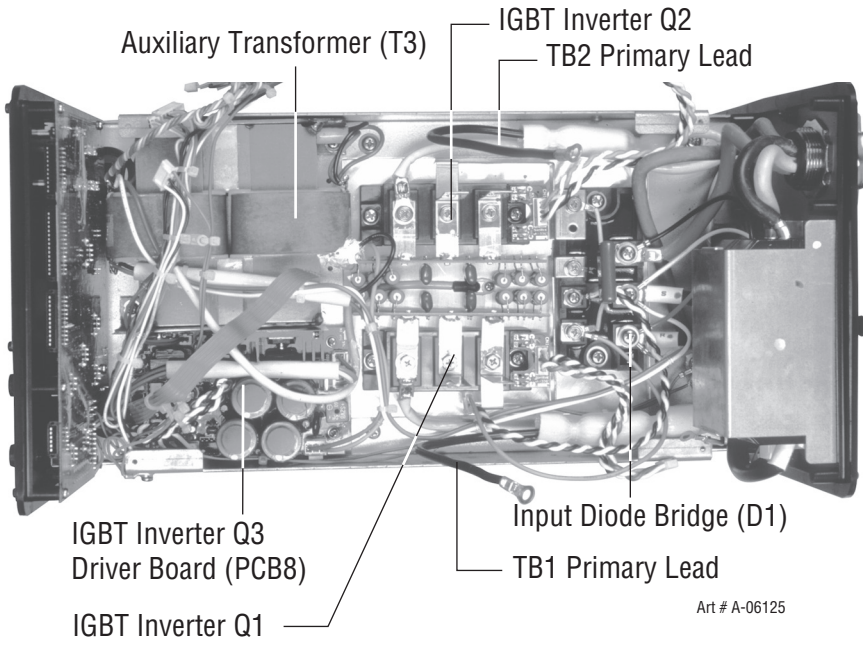


Figure 6-26: IGBT Inverters Q1 and Q2

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6.28 PCA IGBT Inverter Q3/Q4 Replacement Procedure

Refer to figure 6-27.

To remove IGBT Inverters Q3/Q4, do the following.

1. Remove the Output Inductor Assembly refer to the section further in Advanced Troubleshooting.
2. Remove the Output Bus Bar/CT Assembly by removing the bolt inside the POSITIVE (+) OUTPUT TERMINAL and the two screws on the terminals of Q3/Q4 holding the Output Bus Bar/ IGBT Inverter bus bar to IGBT Inverter.
3. Disconnect the lugged wires at terminals AC1 and AC2 on the HF Unit.
4. Disconnect connector CN1 on IGBT Inverter Q3/ Q4.
5. Remove the four (4) screws securing Q3/Q4 to the chassis.

To replace either Inverter Q3/Q4, do the following:

1. Spread a light coating of thermal compound on the bottom surface of the Inverters.
2. Reverse the remaining removal steps above. When replacing the screws that secure the Inverter to the chassis, make sure all screws are started before tightening them. It may be helpful to connect CN2 and CN5 before seating the board fully onto the chassis.

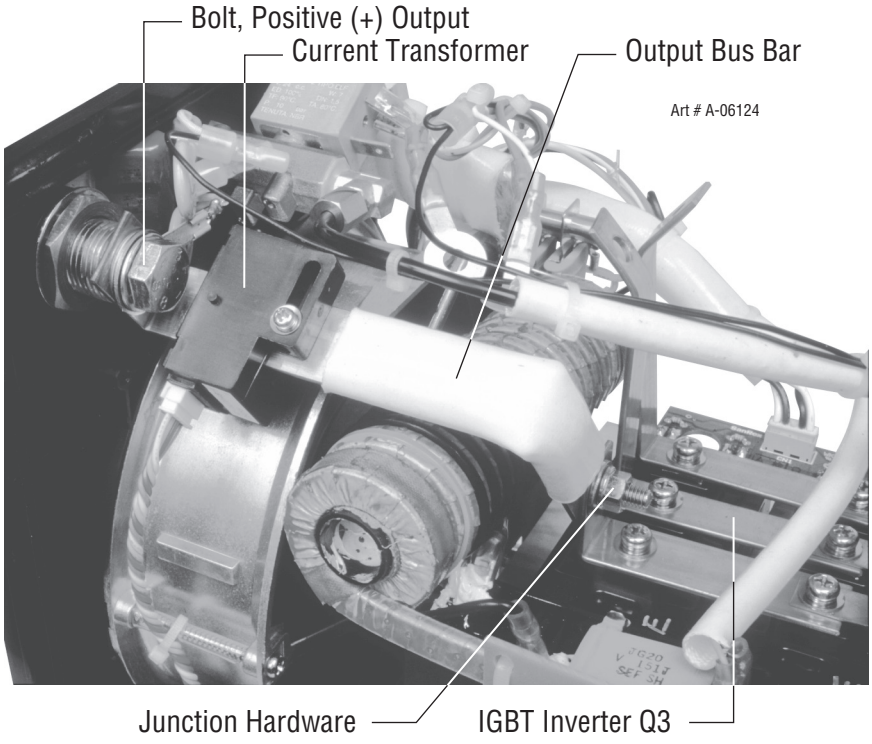


Figure 6-27: IGBT Inverter Q3

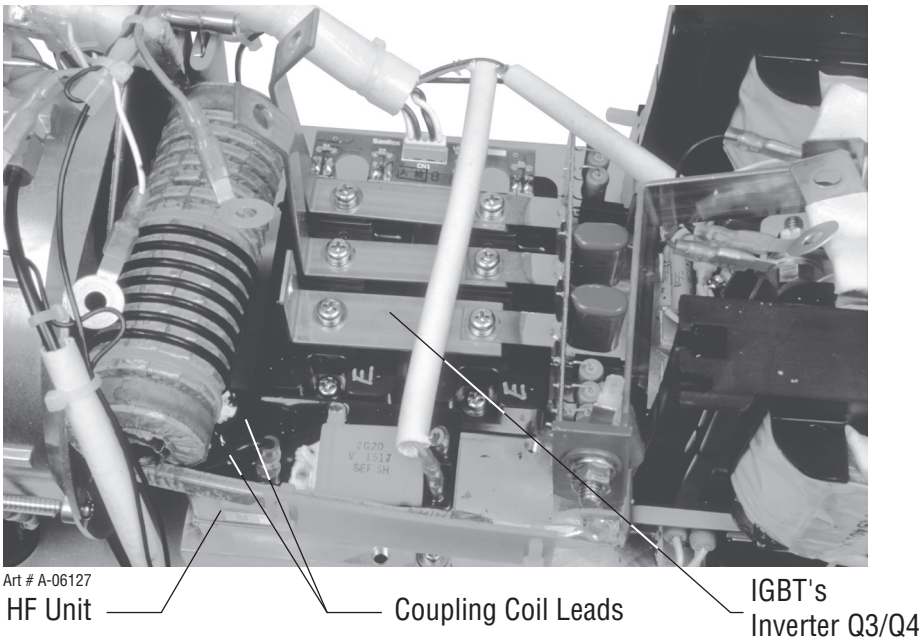


Figure 6-28: IGBT Inverter Q3/Q4

6.29 PCA Output Diodes (D2-D5) Test Procedure

WARNING

Disconnect primary power at the source before performing this procedure.

Refer to figure 6-29 below.

The output section contains four diodes, D2 through D5. Check each diode between its POSITIVE (A) and NEGATIVE (K) TERMINALS. Refer to figure 6-29. Note that these measurements can be accomplished without removing the main transformers. (The transformers were removed in figure 6-29 to aid in identifying the diodes.)

To check for shorted diodes without dismantling the power supply, take a voltmeter set on the diode scale from the GRAY wire and the BROWN on the FCH to the NEGATIVE weld terminal. A good reading will be .2V.

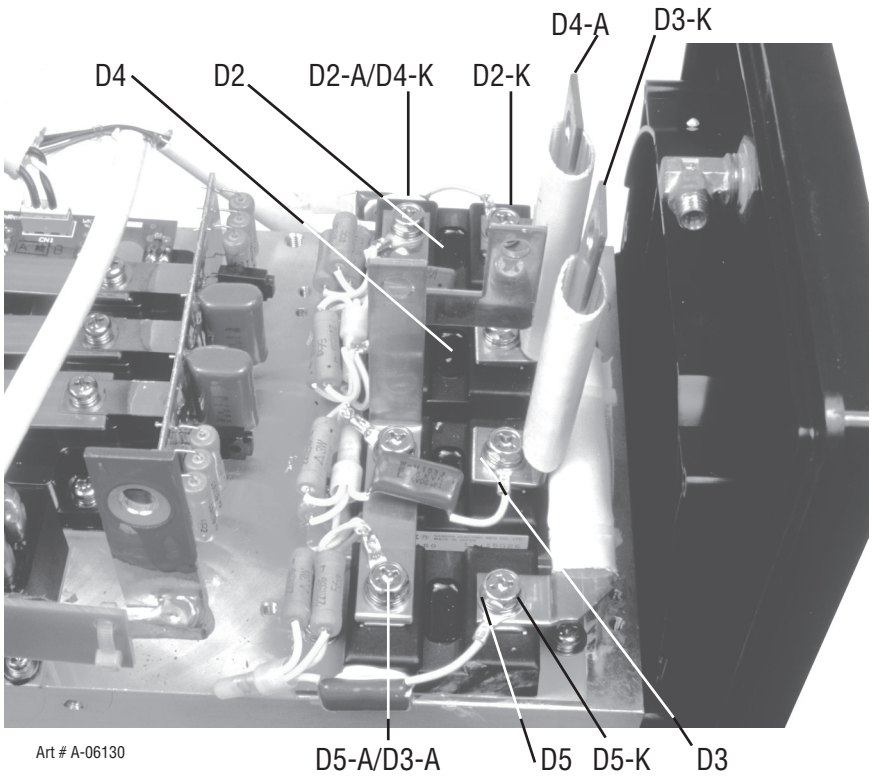


Figure 6-29: Power control assembly - output diodes (D2-D5) (Main transformers removed for clarity)

6.30 PCA Output Diodes (D2 - D5) Replacement Procedure

To gain access to the Output Diodes:

The Main Transformers T1 and T2 and their metal mounting brackets must be removed from the chassis.

1. Remove the Output Inductor Assembly refer to section 6.37 page 6-42.
2. Remove hardware at T1/T2 secondary lead junctions “C”, “D”, and “E”. (Figure 6-30)

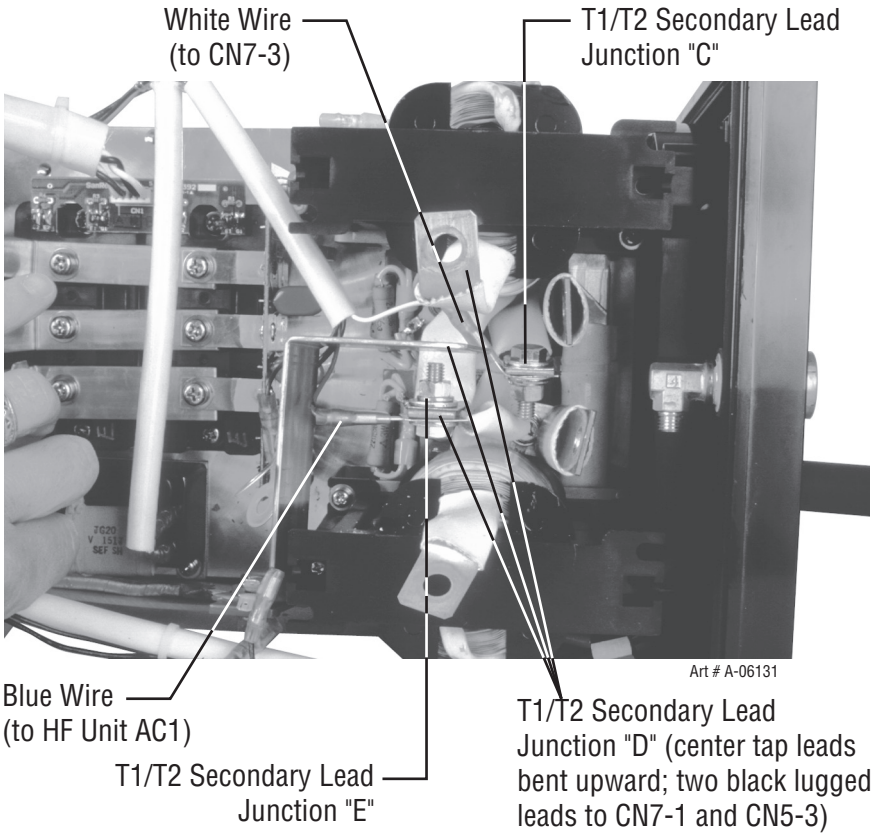


Figure 6-30: Output inductor - T1/T2 lead junctions

3. Remove hardware at Coupling Coil/Bus Bar junction. Remove bus bar. (Figure 6-31)
4. Remove the compression nut from the gas inlet fitting on rear panel and move gas line away from Main Transformers. (Figure 6-31)
5. Remove the two (2) screws that secure Main Transformer T1 and T2 to their metal mounting brackets. Allow the transformers to rest on the work surface. (Figure 6-32)
6. Remove the two metal mounting brackets to expose the output diodes.
7. Remove the bus bar(s) and filter network(s) attached to the terminals of the output diode(s) to be replaced. Output Diodes shown in Figure 6-33.
8. Remove the two (2) screws securing the output diode to the chassis.

To replace the Output Diodes (D2 -D5), do the following:

1. Spread a light coating of thermal compound on the bottom surface of the Diode Assembly.
2. Reverse the remaining removal steps above. When replacing the screws that secure the Diode(s) to the chassis, make sure both screws are started before tightening them.

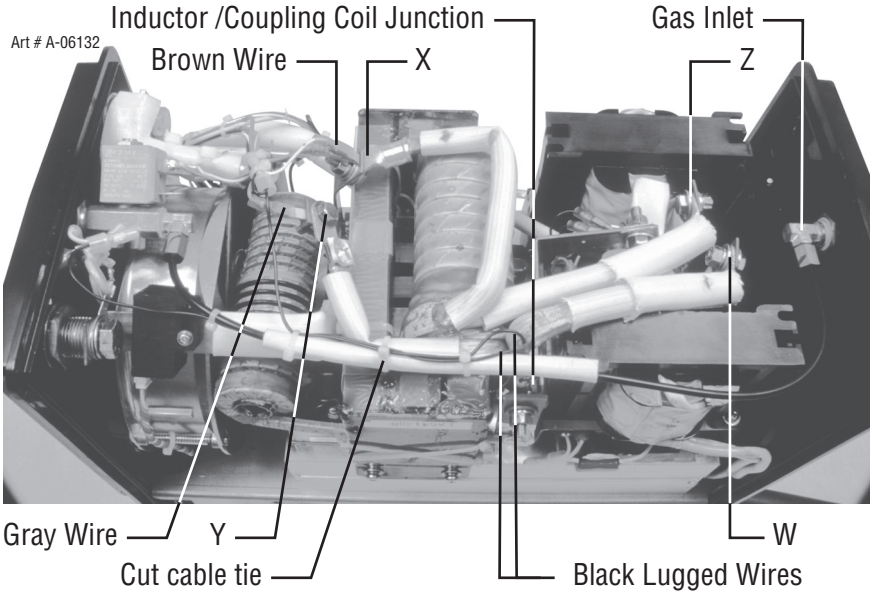


Figure 6-31: Preparation - Main transformer lead junctions

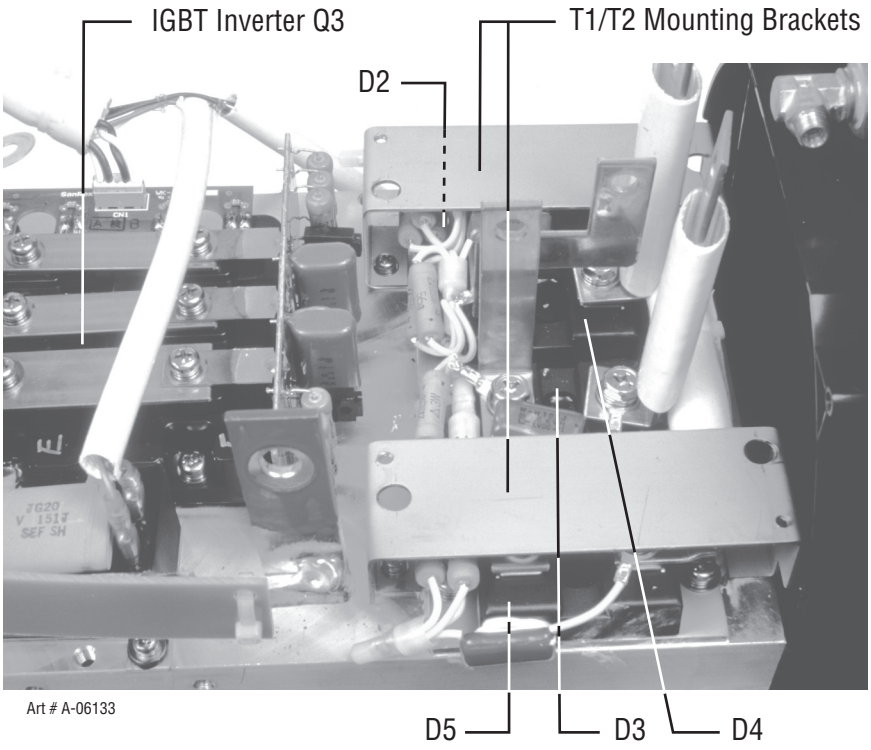


Figure 6-32: Output diodes and T1/T2 mounting brackets

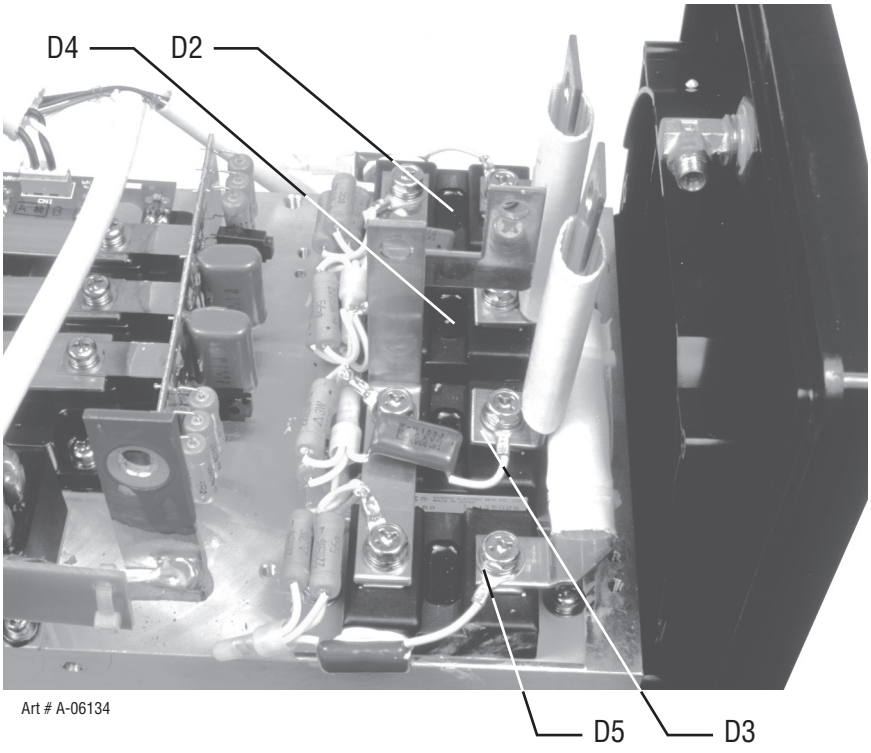


Figure 6-33: Output diodes D2-D5

6.31 PCA Thermal Sensor (TH1) Test Procedure

WARNING

Disconnect primary power at the source before performing this procedure.

Refer to figure 6-34.

1. Select the Ohms scale on the digital meter.
2. Disconnect the connector at CN10 on the Main Circuit Board (PCB1).
3. The resistance of a good sensor measured between pins 1 and 2 on the connector should be in the 10KOhm to 21.6KOhm range, with the reading decreasing as the temperature of the power supply increases. A shorted reading indicates a bad sensor, and it should be replaced.

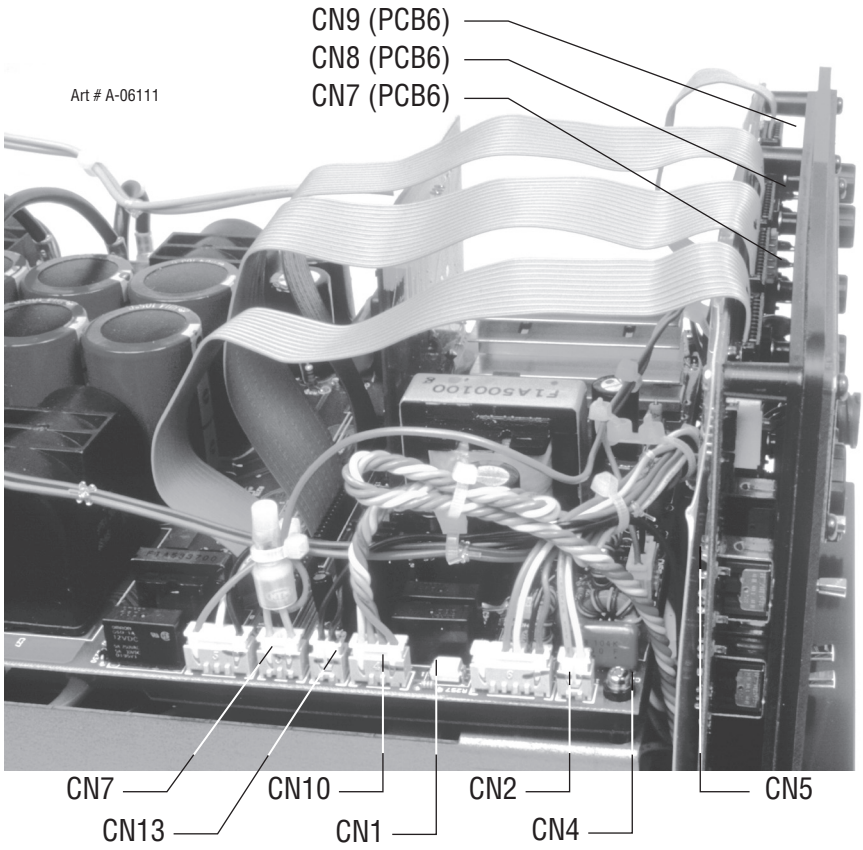


Figure 6-34: Thermal sensor connector on main circuit board (PCB1)

6.32 Thermal Sensor (TH1) Replacement

Refer to figure 6-35.

To remove the Thermal Sensor (TH1), do the following:

1. Remove the Main Circuit Board per section 6.15 page 6-13.
2. Locate the sensor mounted on the main chassis, between the circuit boards (PCB4 and PCB5) that connect to IGBT Inverters Q1 and Q2.
3. Using a magnetic or split screwdriver, remove the screw that secures the sensor to the chassis frame.
4. Cut cable ties as appropriate to free the BLACK/BLACK wire harness that connects the Thermal Sensor to connector CN10 plug.

To replace the Thermal Sensor (TH1), do the following:

1. Spread a light coating of thermal compound on the bottom surface of the Thermal Sensor.
2. Reverse the removal steps above.

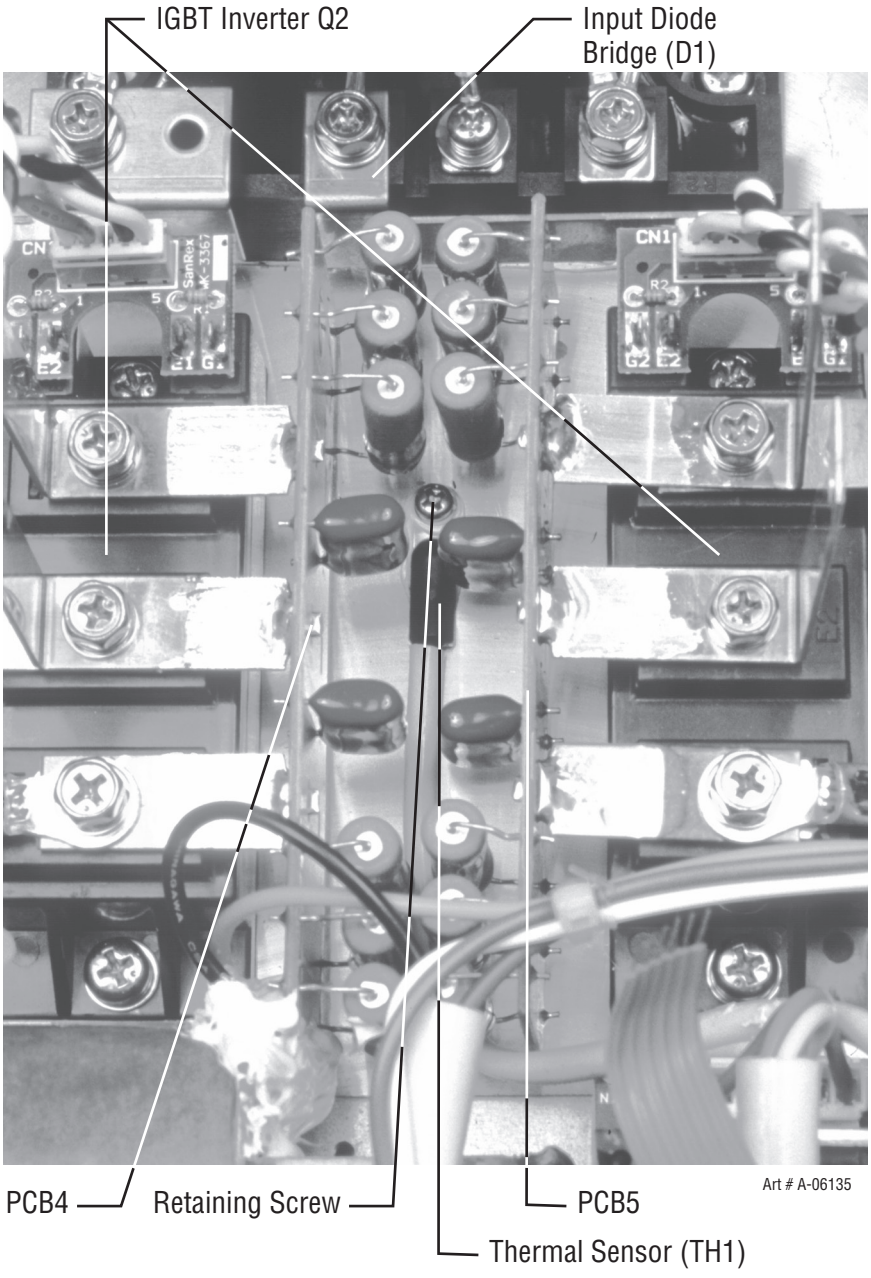


Figure 6-35: Thermal sensor TH1

6.33 Auxiliary Transformer (T3) Test Procedure

The auxiliary transformer can be checked with either a power OFF or power ON test. Do the power OFF test first.

Locate the auxiliary transformer in the bottom front of the power supply.

Power OFF Test

WARNING

Disconnect primary power at the source before performing this procedure.

1. Select the Ohms scale on the digital meter.
2. With the MAIN CIRCUIT BREAKER ON, verify continuity between LINE1 on the MCB and CN19 pin 3 on PCB1-1.
3. Measure the primary winding resistance between LINE 2 on the MCB and CN19 pin 1 to be 74 Ohms (208-230V) or pin 5 (460V) to be 14.8 Ohms.

If there is no continuity, or the resistance measurement yields an open circuit, replace the auxiliary transformer T3.

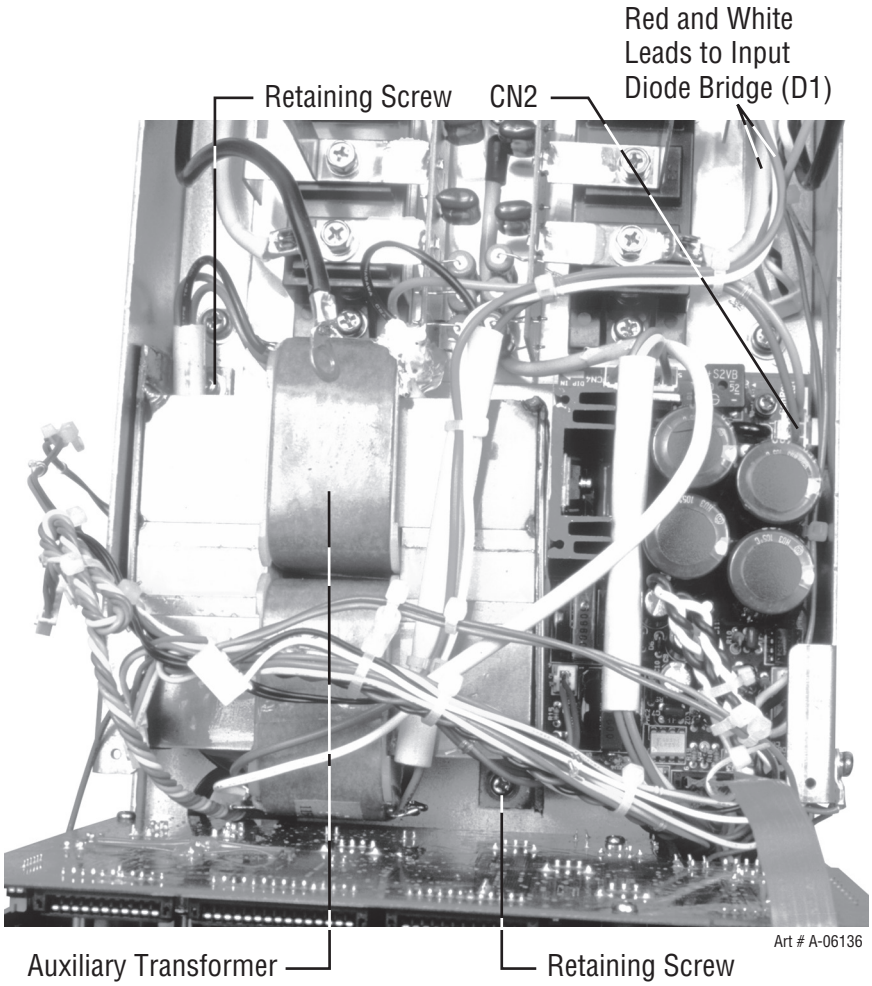


Figure 6-36: Auxiliary transformer

6.34 Auxiliary Transformer (T3) Replacement

Refer to figure 6-36.

To remove the Auxiliary Transformer (T3), do the following:

1. Remove Main Circuit Board, per page 6-13.
2. Remove connector CN1 from PCB8.
3. Remove the RED and WHITE lugged wires from the R and S terminals of the Input Diode Bridge (D1).
4. Remove the two (2) screws securing the Auxiliary Transformer to the chassis.

To replace the Auxiliary Transformer, reverse the removal steps above.

6.35 Main Transformer Assembly (T1 and T2) Test Procedure

WARNING

Disconnect primary power at the source before performing this procedure.

Inspect the primary winding wires on both Main Transformers for breaks in the insulation, signs of overheating or loose connections.

Check for continuity across the primary windings of both transformers.

To do this, do the following:

1. Remove the lugged leads from TB1 and TB2. See Figure 6-37.
2. To test the primary of T1, measure the continuity between Main Circuit Board connector CN8 pin 2 and the lugged transformer lead removed from TB1.
3. To test the primary of T2, measure the continuity between Main Circuit Board connector CN9 pin 2 and the lugged transformer lead removed from TB2.

The secondaries of T1 and T2 cannot be isolated. To test the parallel combination of secondaries:

4. Measure the continuity between the connector CN7 pin 3 and CN5 pin 3.

Replace the Main Transformer/Inductor Assembly if no continuity is found in any of the windings or if there is evidence of overheating.

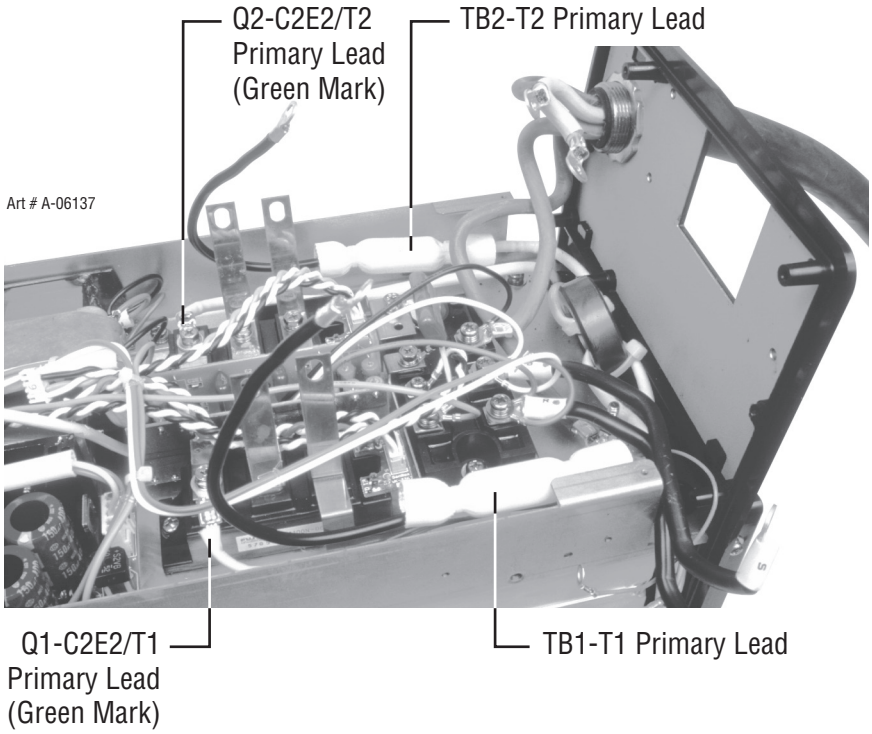


Figure 6-37: Preparation for removal of main transformers T1/T2 (right side of unit from front)

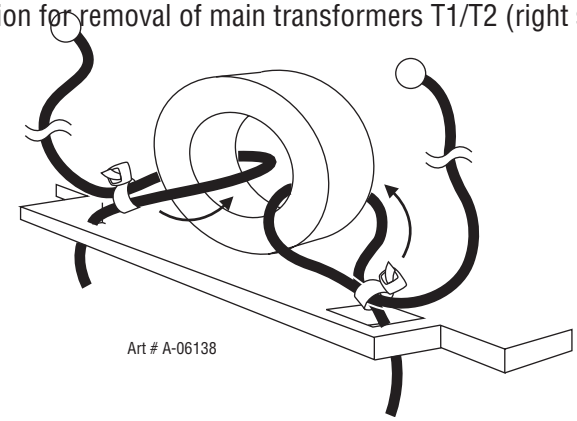


Figure 6-38: T1/T2 primary lead routing through ferrite ring

6.36 Main Transformer (T1 and T2) Assembly Replacement Procedure

To remove Main Transformer T1 or T2:

1. Remove the Main Circuit Board per page 6-13.
2. Remove MAIN CIRCUIT BREAKER and shield, per page 24.
3. Cut cable ties securing T1 or T2 primary leads (WHITE) to ferrite ring (L1). See Figure 6-37
4. Cut cable ties securing insulating sheath on TB1 (T1) or TB2 (T2) at the BLACK/WHITE lead junction.
5. Remove the hardware from the BLACK/WHITE primary lead junction, and remove the lead from the ferrite ring.
6. Remove the WHITE primary lead from the terminal on Q1 (T1) or Q2 (T2).
7. Turn the unit on its side and feed the two WHITE primary leads down through the hole in the chassis in preparation for removing the transformer(s).
8. Remove the Output Inductor Assembly section 6.37 page 6-42.
9. Bend the secondary center tap leads of both transformers T1 and T2 (“D”) up to expose the “C” and “E” secondary lead junctions. See Figure 6-39
10. Remove the hardware from the “C” and “E” secondary leads.
11. Remove the two (2) screws securing the transformer plastic frame to the metal mounting bracket.

To replace Main Transformers T1 or T2, reverse the removal steps.

NOTE

For proper phase connections to T1 and T2, the primary leads marked with GREEN paint connect to the IGBT Inverter terminals. Also note the lead routing through the ferrite ring (L1). Refer to figure 6-38.

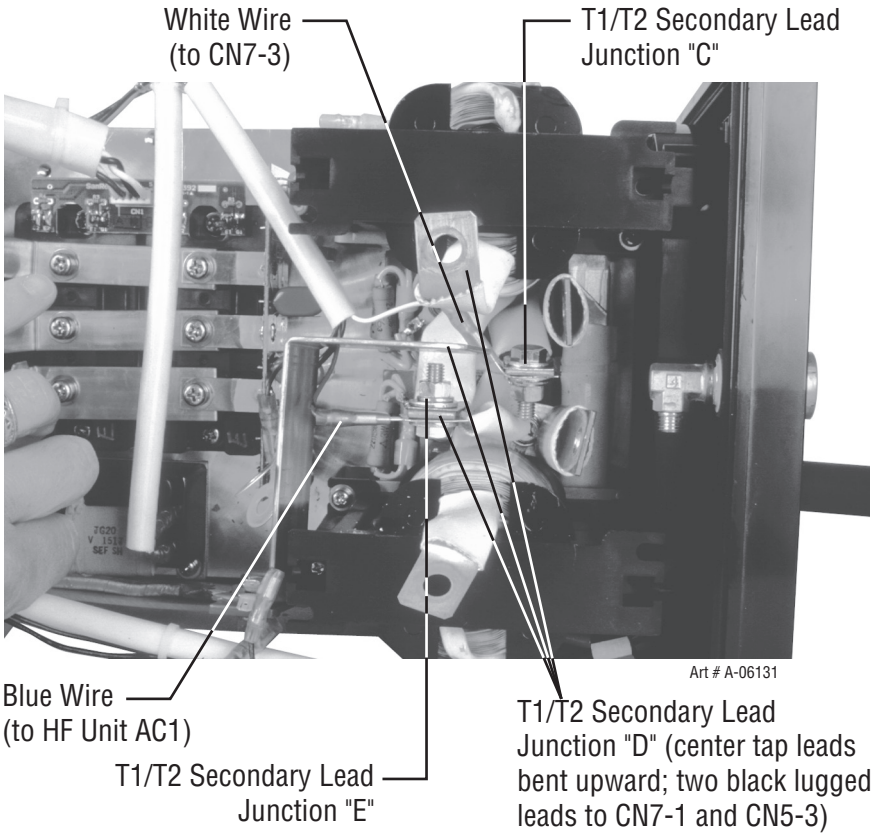


Figure 6-39: Preparation for removal of main transformers T1/T2

6.37 Output Inductor Assembly Test and Replacement Procedures

Test Procedure

1. Inspect the Output Inductor Assembly for signs of overheating or loose connections.
2. Check for continuity through the Inductors by measuring between pairs of test points “W” and “X”, and “Y” and “Z”. Refer to figure 6-40.

Replace the Output Inductor Assembly if there is no continuity or if there is evidence of overheating.

Replacement Procedure

Refer to Figures 6-40 and 6-41

To remove the Output Inductor Assembly:

1. Remove the four (4) bolts and hardware from the Output Diode/Inductor Assembly junctions at W, X, Y and Z.
2. Cut the middle cable tie securing the BLACK gas hose/wire harness to the Output Inductor Assembly lead Y.
3. Remove the compression nut on the gas inlet on the rear panel. Move the gas hose/wire harness to clear the Output Inductor Assembly.
4. Cut two (2) cable ties that form an “X” which secure the Coupling Coil to the frame of the Output Inductor Assembly. Figure 6-41
5. Remove the four (4) screws that secure the frame of the Output Inductor Assembly to the main chassis frame.
6. Pull the Output Inductor Assembly out of power supply.

To replace the Output Inductor Assembly, reverse the removal steps above.

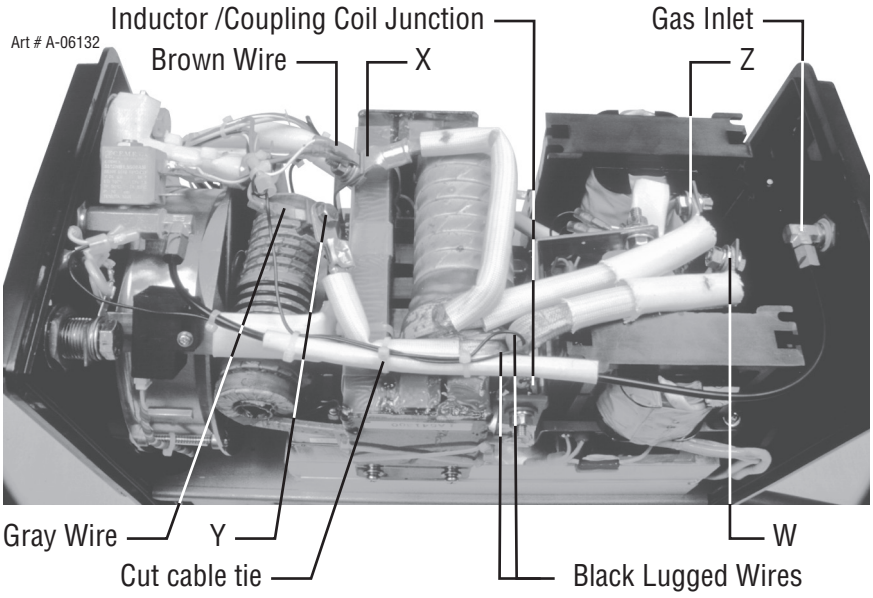


Figure 6-40: Output inductor assembly test points

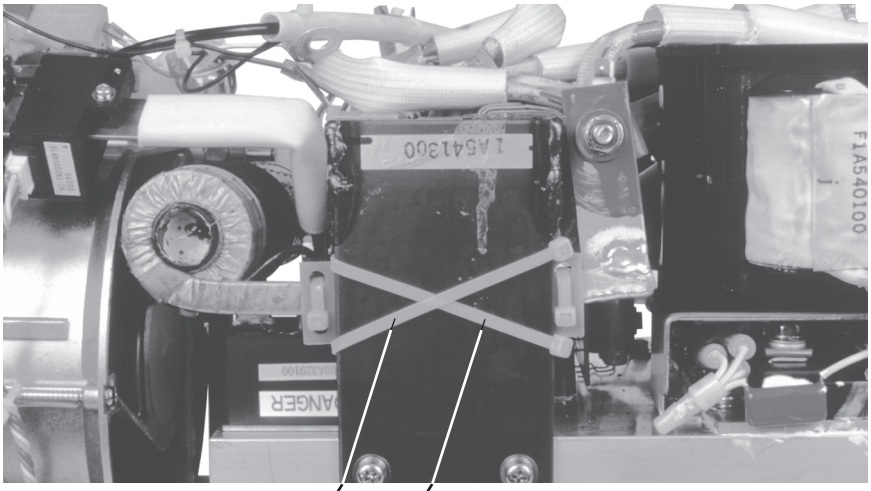


Figure 6-41: Coupling coil cable ties

6.38 Fan Assembly Replacement Procedure

Refer to figures 6-42 and 6-43.

To remove fan:

1. Remove the Output Inductor Assembly per section 6.37 page 6-42.
2. Remove the bolt inside the POSITIVE (+) OUTPUT TERMINAL and the hardware from the Output Bus Bar/IGBT Inverter Q3/Q4 junction.
3. Disconnect the connector from the Current Transformer and remove the Output Bus Bar/CT Assembly.
4. Cut the cable ties securing wiring harnesses to both screws that secure the fan assembly to the front panel.

The next steps free the wiring harness/gas hose to allow access to the fan retaining screws. Figure 6-43.

5. Loosen the top screw securing R6 to the front panel to allow R6 to rotate downward.
6. Remove the compression nut on both ends of the black gas hose.
7. Remove the YELLOW and VIOLET lugged wires from the gas solenoid.
8. Disconnect CN1 from IGBT Inverter Q3/Q4.
9. Disconnect the lugged BLUE and GRAY wires from the HF Unit.
10. Follow the RED/BLACK twisted wire pair from the fan through the hole in the chassis. Cut cable ties as needed to locate a section of the wire pair where it can be cut and spliced together easily when the fan assembly is replaced. Cut the RED/BLACK wire pair (it connects to CN2 with the YELLOW and VIOLET pair from the gas solenoid).
11. Remove the two (2) screws securing the fan assembly to the front panel. Slide the fan assembly back slightly and out toward the left side of the unit, away from the R6 assembly.

To replace the fan reverse the removal steps above.

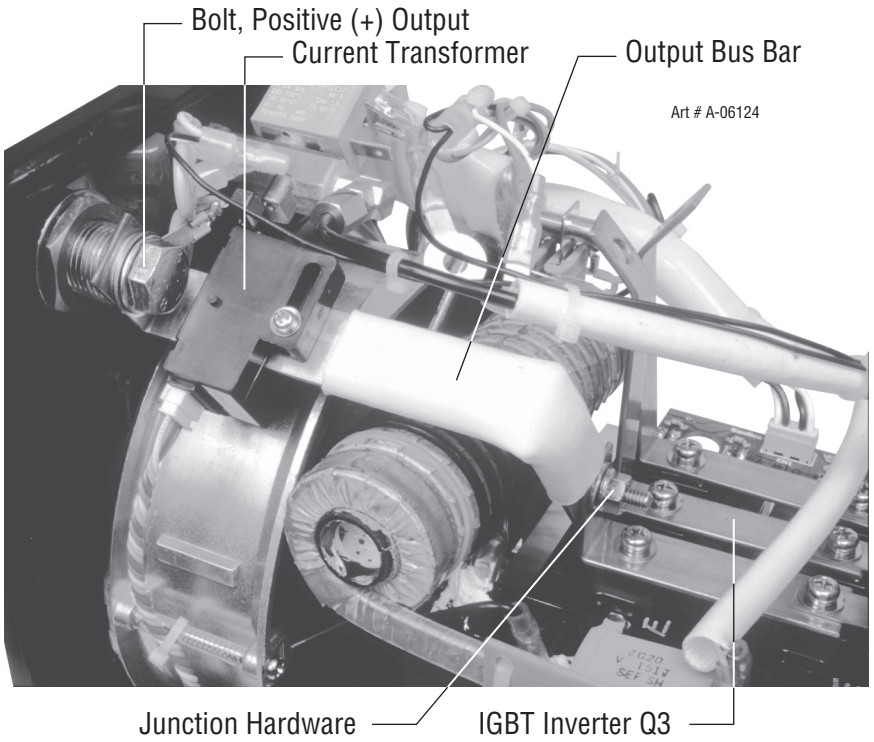


Figure 6-42: Output bus bar/CT assembly

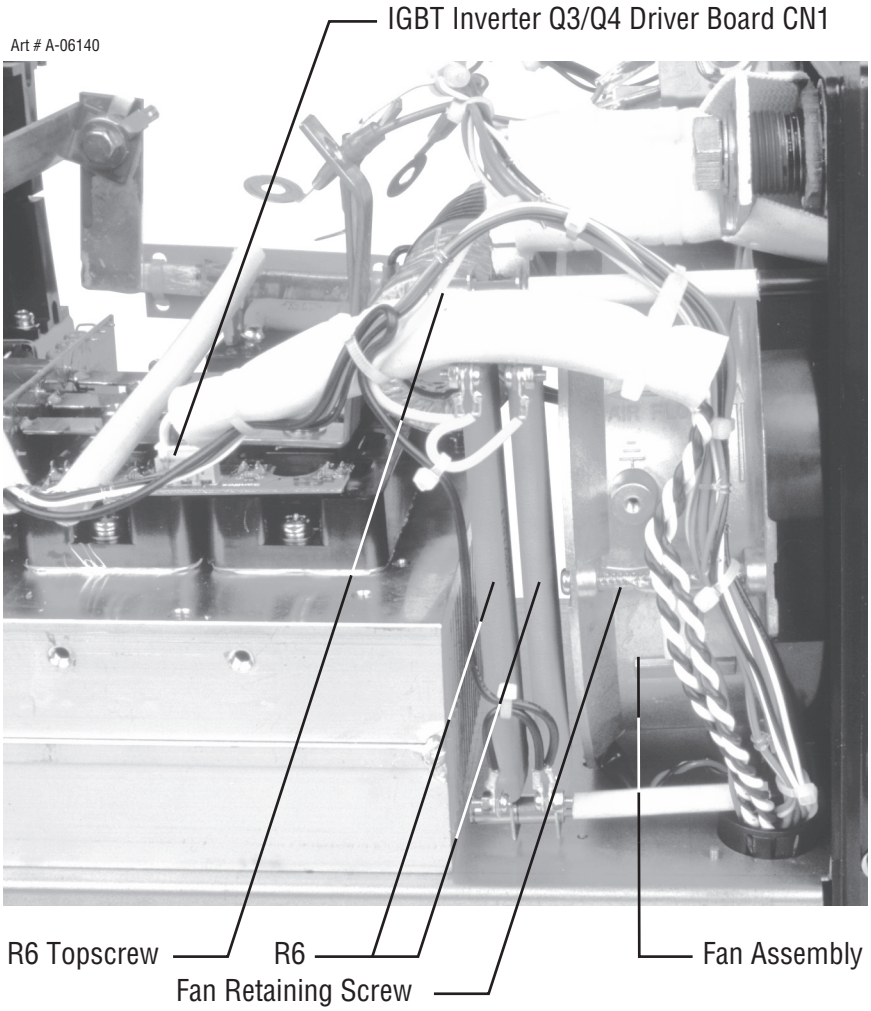


Figure 6-43: Cable ties and R6 on right side of unit

6.39 HF Unit Test and Replacement Procedures

HF Unit Test Procedure

1. Place the PROCESS SELECTOR Switch in the STICK position.
2. Jumper pins 1 and 5 on the CN7 plug. Apply power to the unit.
3. If the high frequency buzz is heard coming from the HF Unit, the Main Circuit Board (PCB1) should be replaced. If no sound is heard coming from the HF Unit, the HF Unit should be replaced.

HF Unit Replacement Procedure

To remove the HF Unit:

1. Remove the Output Inductor Assembly per section 6.37 page 6-42.
2. Remove the Output Bus Bar/CT Assembly by removing the bolt inside the POSITIVE (+) OUTPUT TERMINAL and the two screws holding the bus bar to Q3/Q4. Remove the connector from CT1.
3. Remove the Coupling Coil by removing the bolt inside the NEGATIVE (-) OUTPUT TERMINAL and hardware from the bus bar/T1/T2 center tap junction.
4. Disconnect BLACK wires to the HF Unit.
5. Remove the lugged wires from the AC1 and AC2 terminals.
6. Remove the two (2) screws that secure the HF Unit to the chassis.

To replace the HF Unit:

1. Apply a liberal amount of thermally-conductive grease to the bottom of the new HF Unit.
2. Hold the new HF Unit against the chassis while you replace the two screws that hold the HF Unit onto the chassis. Be sure to orient the new HF Unit in a similar manner to the one just removed, with the AC1/AC2 terminals and resistor R1 toward the front of the unit.
3. Reverse the remaining removal steps.

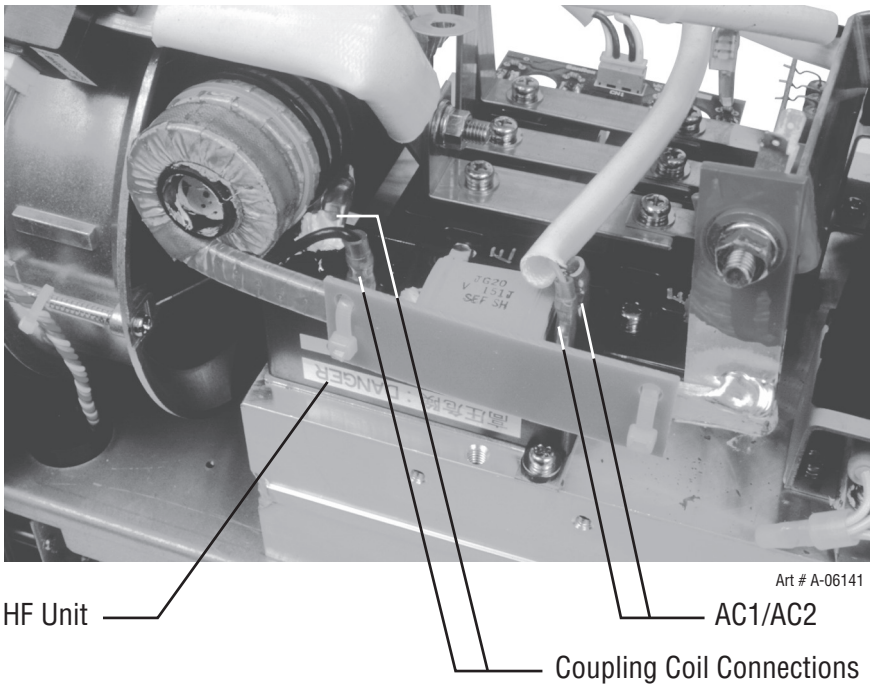


Figure 6-44: HF Unit replacement

6.40 HF Coupling Coil Test and Replacement Procedures

HF Coupling Coil Test Procedure

1. Visually inspect coil primary and secondary for overheating or other damage.
2. Check connections of coil wires on HF Unit terminals CC1 and CC2.
3. Verify continuity through the coils.

Replace the HF Coupling Coil if damaged or continuity is broken.

HF Coupling Coil Replacement Procedure

Refer to figure 6-45.

To remove the HF Coupling Coil:

1. Remove the Output Inductor Assembly per section 6.37 page 6-42.
2. Remove the bolt from the inside of the NEGATIVE (-) OUTPUT TERMINAL.
3. Remove the bolt from the inside of the POSITIVE (+) OUTPUT TERMINAL.
4. Disconnect the connector on CT1.
5. Remove the hardware securing the Output Bus Bar to IGBT Inverter Q3. Remove the Output Bus Bar/CT Assembly.
6. Remove the Coupling Coil from the unit, disconnecting the BLACK lugged wires from the HF Unit as the Coupling Coil is removed.

To replace the HF Coupling Coil, reverse the removal steps.

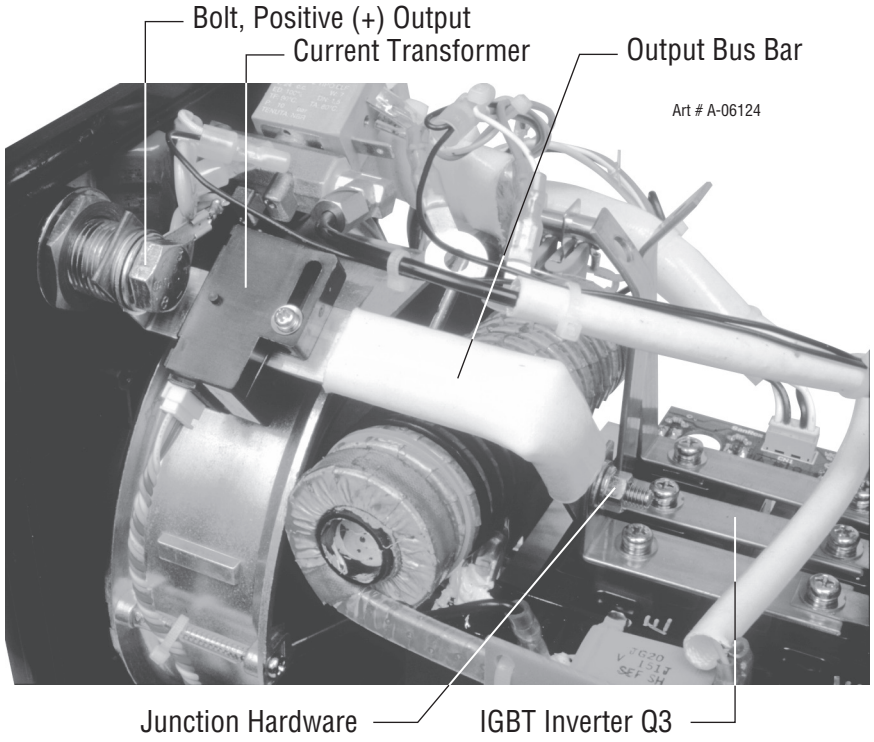


Figure 6-45: Output bus bar/CT assembly

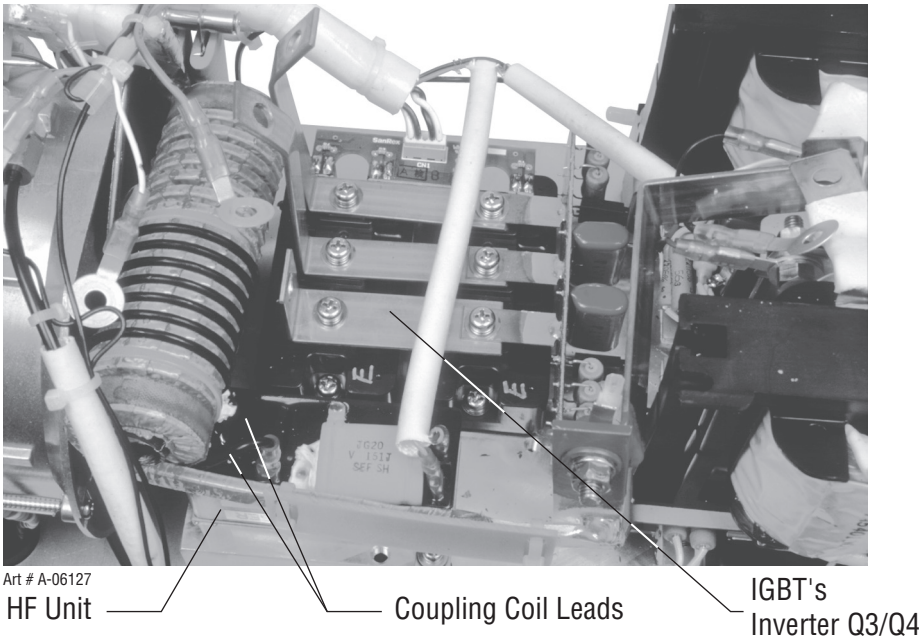


Figure 6-46: Coupling coil replacement

6.41 Gas Solenoid Valve Replacement Procedure

Refer to figure 6-47.

To remove the gas solenoid valve:

1. Remove the YELLOW/VIOLET wires from the lugs on the solenoid valve.
2. Remove the compression nut securing the black gas line to the solenoid valve.
3. Remove the “C” retaining ring from the gas input fitting on the exterior of the Front Panel.
4. Remove the gas solenoid valve from the unit.

To replace the gas solenoid valve, reverse the above steps.

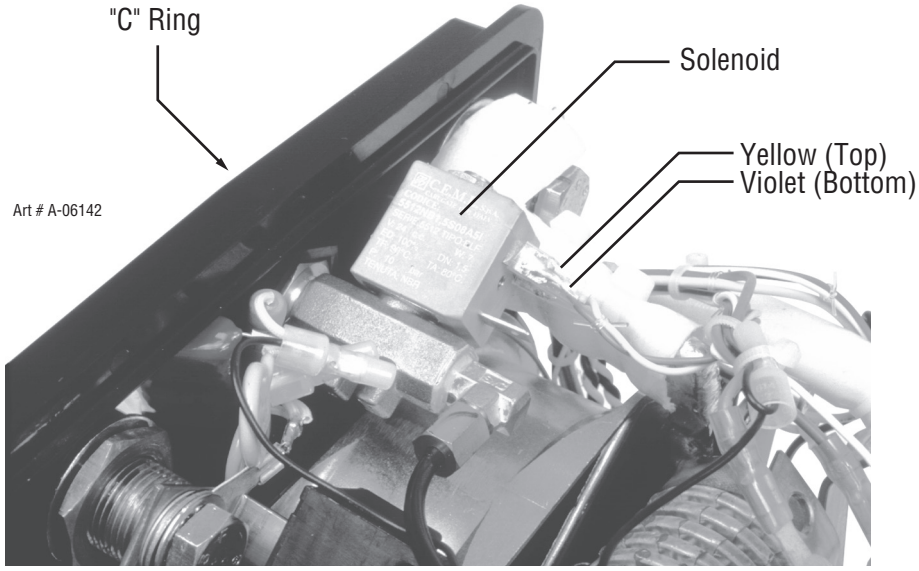


Figure 6-47: Gas solenoid valve

6.42 IGBT Inverter Q3/Q4 Driver Circuit Board (PCB8) Test Procedure

Refer to figure 6-48.

1. Locate and remove connector CN1 on the IGBT Inverter Q3/Q4.
2. Using a digital meter on the diode scale, test for diodes on the CN1 connector plug between pin pairs 1-2 and 4-5. Shorted readings indicate that the IGBT inverter Q3/Q4 Driver Circuit Board (PCB8) should be replaced.

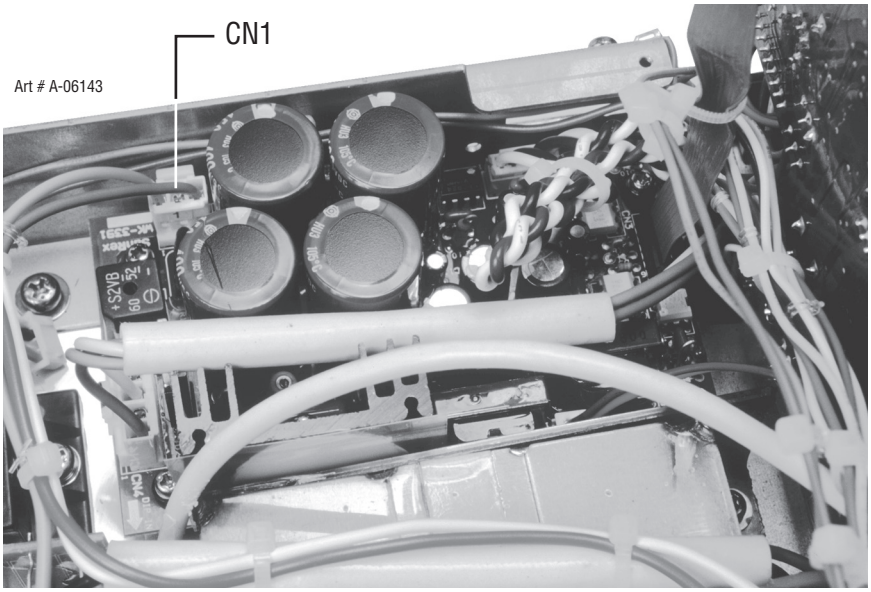


Figure 6-48: Location of CN1 on IGBT inverter Q3/Q4 driver board

6.43 IGBT Inverter Q3/Q4 Driver Circuit Board (PCB8) Replacement Procedure

Refer to figure 6-49.

To remove PCB8, do the following:

1. Remove the Main Circuit Board, per page 6.13.
2. Remove connector CN1, CN2 and CN4 from PCB8.
3. Cut cable ties securing ribbon cable at CN3 to GREEN ground wires.
4. Remove the four (4) screws securing PCB8 to the chassis. As the board is lifted off the chassis, disconnect connector CN5.

To replace PCB8, reverse the removal steps above. It may be helpful to connect CN2 and CN5 before seating the board fully back onto the chassis.

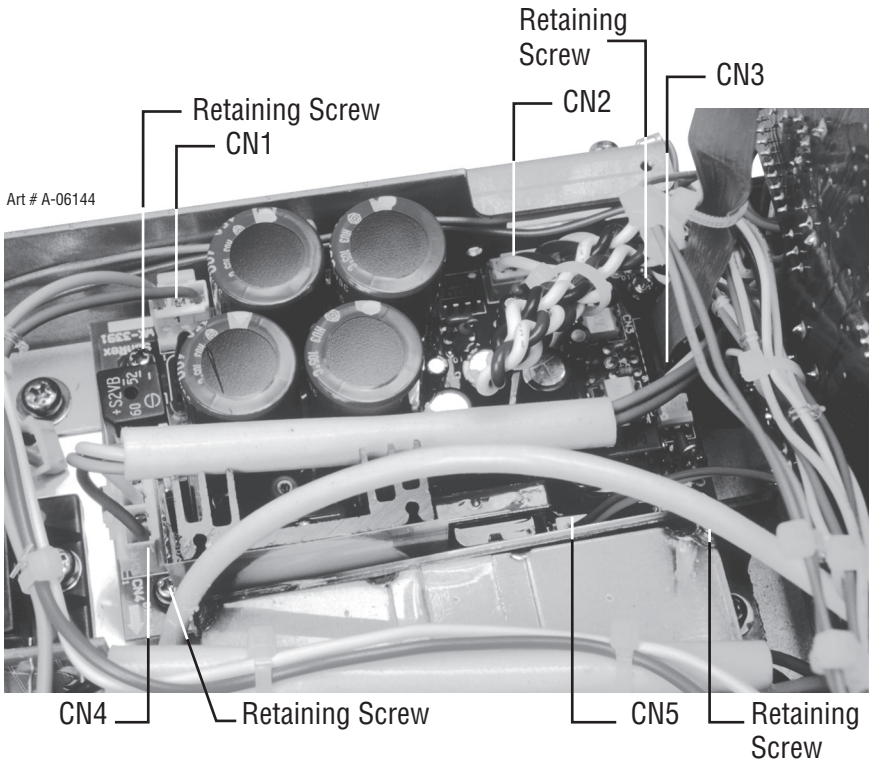


Figure 6-49: AC waveform circuit board (PCB8)

6.44 Sequence Timing Diagrams

HF TIG Mode

Figure 6-50 shows the HF TIG timing waveforms with the SLOPE control ON and OFF.

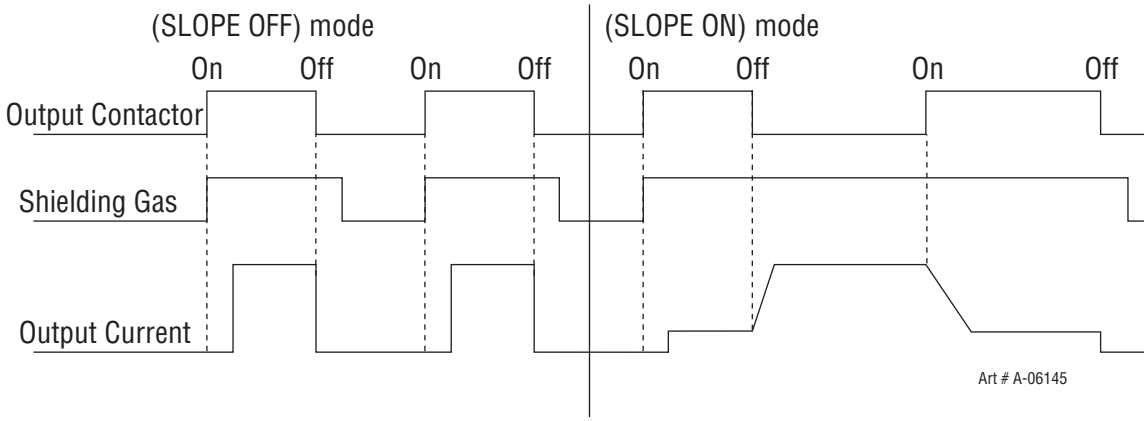


Figure 6-50: HF TIG mode timing

Lift TIG Mode

Figure 6-51 shows the LIFT TIG timing waveforms with the SLOPE control ON and OFF.

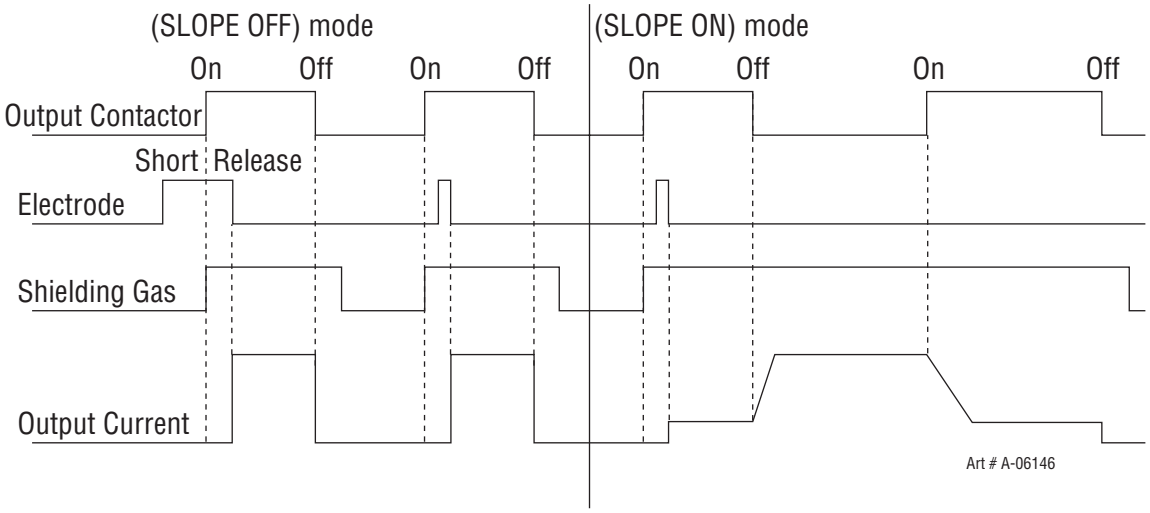


Figure 6-51: LIFT TIG mode timing

Current Waveform on PULSE ON mode

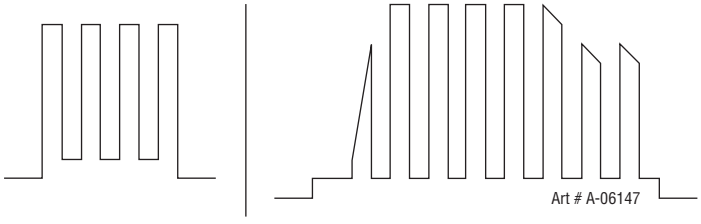


Figure 6-52: LIFT TIG mode pulse on current waveform

SPOT Mode

Figure 6-53 shows the SPOT timing waveforms with the SLOPE control OFF and ON.

Works only in HF TIG mode

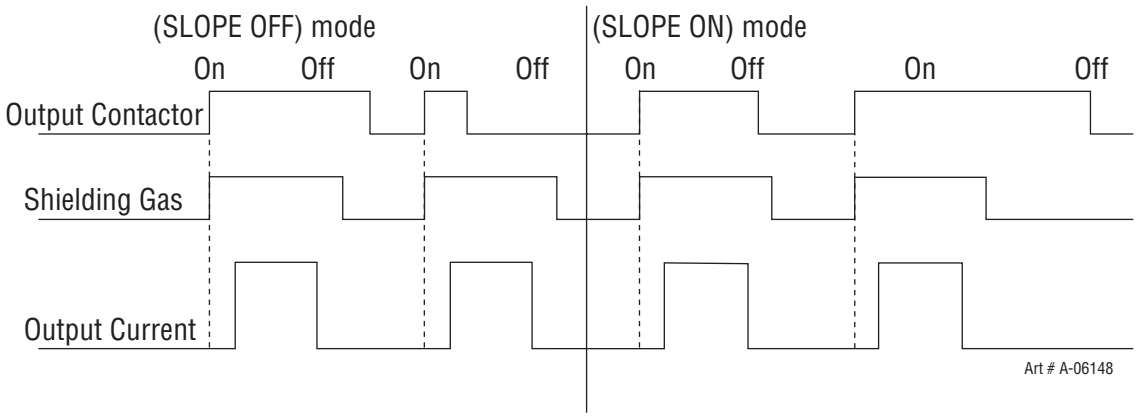


Figure 6-53: SPOT/HF TIG mode timing

SECTION 7: PARTS LIST

7.01 Equipment Identification

All identification numbers as described in the Introduction chapter must be furnished when ordering parts or making inquiries. This information is usually found on the nameplate attached to the equipment. Be sure to include any dash numbers following the Specification or Assembly numbers.

7.02 How To Use This Parts List

The Parts List is a combination of an illustration and a corresponding list of parts which contains a breakdown of the equipment into assemblies, subassemblies, and detail parts. All parts of the equipment are listed except for commercially available hardware, bulk items such as wire, cable, sleeving, tubing, etc., and permanently attached items which are soldered, riveted, or welded to other parts. The part descriptions may be indented to show part relationships.

To determine the part number, description, quantity, or application of an item, simply locate the item in question from the illustration and refer to that item number in the corresponding Parts List.

SPEC NUMBERS:

208/230VAC Single-Voltage, Single-/Three-Phase	**103024**
208/230/460VAC Single-/Three-Phase	**103025**
380/415VAC Single-Voltage, Three-Phase	**103038**

7.03 Parts List

ITEM #	DESCRIPTION	LOCATION	QTY.	208/230 MODEL CAT. #	380/415 MODEL CAT. #	230/460 MODEL CAT. #	VENDOR #
1	Front Upper Metal Panel		1	10-5341	10-5341	10-5341	A3A439400
1	Front Upper Metal Panel*		1	10-6346	10-6346	10-6346	600019
2	Knob, large		1	10-5233	10-5233	10-5233	50551002900
2.1	Poteniometer		1	10-6363	10-6363	10-6363	41114001000
3	Knob, small		4	10-5232	10-5232	10-5232	50551002100
not shown	Poteniometer		6	10-5056	10-5056	10-5056	41114001100
not shown	Remote Receptacle w/ harness	CON1	1	10-6324	10-6324	10-6324	U0A397400
not shown	Remote Receptacle w/ harness	CON1	1	N/A	10-6336	N/A	U0A397800
5	Front Plastic Frame		1	10-5462	10-5462	10-5462	A3A441900
6	Gas Outlet Fitting		1	10-5073	10-5073	10-5073	E6A475200
6	Gas Outlet Fitting (CE)		1	N/A	10-5449	N/A	E6A967700
7	C-Ring, Gas Vavle			10-5184	10-5184	10-5184	53003000600
8	Female Output Terminal		2	10-5131	10-5131	10-5131	26999010100
not shown	Switch, toggle, 3 pos. (WK-3369)	pulse, slope, process	3	10-5570	10-5570	10-5570	24703128400
not shown	Switch, toggle, 3 pos. (WK-3988)	pulse, slope, process	3	10-6365	10-6365	10-6365	24655000100
not shown	Switch, toggle, 2 pos. (WK-3369)	AC/DC	1	10-5057	10-5057	10-5057	24703128000
not shown	Switch, toggle, 2 pos. (WK-3988)	AC/DC	1	10-6364	10-6364	10-6364	24655000200
10	Label, Warning, Explanation		1	10-5496	10-5496	10-5496	N0B476400
not shown	Label, Warning, Illustration		1	10-5497	10-5497	10-5497	N0B476500
11	Label, Side		2	10-5499	10-5499	10-5499	N0B477000
12	Case Half		2	10-5461	10-5461	10-5461	E0C181200
13	Screws		4				
14	Rubber Foot		4	10-5411	10-5411	10-5411	E6A181600
15	Screws		5				
16	Main Circuit Breaker	MCB	1	10-6321	10-5224	10-5224	25850001800
17	Easylink Switch	S2	1	N/A	N/A	10-5222	24704531400
not shown	Input Cable Clamp		1	10-5409	10-5409	10-5409	A4A449800
not shown	Input Power Cable		1	10-5239	10-5239	10-5239	52026000500
20	Gas Inlet Fitting		1	10-5075	10-5075	10-5075	E5A925600
20	Gas Inlet Fitting (CE)		1	N/A	10-5201	N/A	E6A586600
not shown	Rear Plastic Frame		1	10-5525	10-5525	10-5525	A3A446900
not shown	Rear Upper Metal Panel		1	10-5390	N/A	N/A	A3A444400
not shown	Rear Upper Metal Panel		1	N/A	10-5391	N/A	A3A444600
not shown	Rear Upper Metal Panel (CE)		1	N/A	10-5392	N/A	A3A444700
not shown	Rear Upper Metal Panel		1	N/A	N/A	10-5393	A3A444400
23	Heatsink		1	10-5455	10-5455	10-5455	E0B869600
24	Main PCB	PCB1	1	10-6317	N/A	N/A	P0A344816
24	Main PCB	PCB1	1	N/A	10-6350	N/A	P0A344815
24	Main PCB	PCB1	1	N/A	N/A	10-6318	P0A344817

ITEM #	DESCRIPTION	LOCATION	QTY.	208/230 MODEL CAT. #	380/415 MODEL CAT. #	230/460 MODEL CAT. #	VENDOR #
25	Fan Assembly	FAN1	1	10-5092	10-5092	10-5092	33311123600
25	Fan Assembly	before 9/29/95	1	10-5142	10-5142	10-5142	33311119700
26	Current Transformer	CT1	1	10-5003	10-5003	10-5003	11251003000
27	Coupling Coil	CC	1	10-5146	10-5146	10-5146	F1A570400
28	HF Unit		1	10-5024	10-5024	10-5024	U0A329100
28	HF Unit w/ resistor		1	10-6325	10-6325	10-6325	U0A418000
29	Ouput Inductor	FCH	1	10-5145	10-5145	10-5145	F1A541300
30	Transformer, Main	T1,T2	2	10-5474	N/A	10-5474	F1A611600
30	Transformer, Main	T1,T2	2	N/A	10-5475	N/A	F1A611600
31	Front Panel PCB	PCB6	1	10-5148	10-5148	10-5148	P0A336900
31	Front Panel PCB*	PCB6	1	10-6347	10-6347	10-6347	P0A398800
32	Resistor	R6	2	10-5137	10-5137	10-5137	40511000200
not shown	11 Pin Ribbon Cable		1	10-5236	10-5236	10-5236	52003000700
not shown	15 Pin Ribbon Cable		1	10-5234	10-5234	10-5234	52003000500
not shown	12 Pin Ribbon Cable		1	10-5235	10-5235	10-5235	52003000600
36	Gas Valve	SOL1	1	10-5007	10-5007	10-5007	34910000400
36.1	Elbow Union		2	10-5316	10-5316	10-5316	67842112900
37	Auxilary Transformer	T3	1	10-5143	N/A	10-5143	F1A540800
37	Auxilary Transformer	T3	1	N/A	10-5469	N/A	F1A540900
37	Auxilary Transformer (CE)	T3	1	N/A	10-5469	N/A	F1A540900
38	IGBT Kit	Q1,Q2	2	10-6320	10-6320	N/A	Z000348300
38	IGBT Kit	Q1,Q2	2	N/A	N/A	10-6320	Z000348300
39	Input Rectifier	D1	1	10-2653	N/A	10-2653	45707016000
39	Input Rectifier	D1	1	N/A	10-5088	N/A	45704016000
40	Capacitor	C1	1	10-2270	10-2270	10-2270	42422137100
41	Thermal Sensor	TH1	1	10-5228	10-5228	10-5228	46965000900
42	AC Driver PCB	PCB8	1	10-5149	10-5149	10-5149	P0A339100
43	Secondary IGBT	Q3,Q4	2	10-5140	10-5140	10-5140	43460002101
44	Snubber Circuit	PCB10	1	10-5151	10-5151	10-5151	P0A339300
45	Output Diodes	D2,D3,D4.D5	4	10-2630	10-2630	10-2630	458660050
46	AC Gate PCB	PCB9	1	10-5150	10-5150	10-5150	P0A339200
not shown	Cover, PCB		1	10-5419	10-5419	10-5419	E6A490100
not shown	Clip, PCB Cover		4	10-5259	10-5259	10-5259	60602422000
not shown	Panel PCB Shield		1	10-5443	10-5443	10-5443	E7A150000
not shown	Main Circuit Breaker Sheild		1	10-5484	10-5484	10-5484	J2B748200
50	Main Circuit Breaker Shield (CE)		1	N/A	10-5488	N/A	J2B858600
not shown	Male Output Terminal		2	10-2020	10-2020	10-2020	WDC50P
not shown	6 Pin Ribbon Cable		1	10-5237	10-5237	10-5237	52003000800
53	Resistor	R2-R5	12	10-2213	10-2213	10-2213	40305122000
not shown	Capacitor	C2-C5	4	10-5014	10-5014	10-5014	42421138400
not shown	PLUG, 8 PIN REMOTE						
	-----BODY		1	10-5000	10-5000	10-5000	206434-1
	-----CLAMP		1	10-5001	10-5001	10-5001	206062
	-----PINS		7	10-5002	10-5002	10-5002	745229-7
not shown	HF resistor	R1	1	10-5080	10-5080	10-5080	40511000600

ITEM #	DESCRIPTION	LOCATION	QTY.	208/230 MODEL CAT. #	380/415 MODEL CAT. #	230/460 MODEL CAT. #	VENDOR #
not shown	Digital Meter Kit (opt.)	PCB7	1	10-4000	10-4000	10-4000	N/A
not shown	Meter Lens		1	10-6340	10-6340	10-6340	D6A604700
not shown	Meter PCB	PCB7	1	10-5126	10-5126	10-5126	P0A337500
not shown	Capacitor	C6, C7	2	10-2219	10-2219	10-2219	42442007100
not shown	Capacitor	C8	1	10-5013	10-5013	10-5013	42421138500
not shown	Resistor	R7	1	10-5010	10-5010	10-5010	40305147200
not shown	Screws	R6	2	10-5241	10-5241	10-5241	53001028200
not shown	Screws	Fan	2	10-5240	10-5240	10-5240	53001026300
65	Snubber Circuit	PCB4, 5	2	10-5121	10-5121	10-5121	P0A336600
66	Bus Bar	D1 to Q1	1	10-5412	10-5412	10-5412	E6A419300
67	Bus Bar	D1 to Q2	1	10-5413	10-5413	10-5413	E6A419400
68	Bus Bar	Q1,Q2 to PCB	4	10-5414	10-5414	10-5414	E6A419500
69	Bus Bar	Q1,Q2 to PCB	5	10-5415	10-5415	10-5415	E6A419600
70	Bus Bar	Q3, Q4 to FCH	1	10-5447	10-5447	10-5447	E6A930600
71	Bus Bar	Output Diodes	2	10-5433	10-5433	10-5433	E6A653100
72	Bus Bar	Output Diodes	2	10-5434	10-5434	10-5434	E6A653300
73	Bus Bar	Output Diodes	1	10-5432	10-5432	10-5432	E6A52900A
74	Bus Bar	Output Diodes	1	10-5420	10-5420	10-5420	E6A558900
75	Bus Bar	Q3, Q4 to FCH	1	10-5421	10-5421	10-5421	E6A559000A
76	Bus Bar	Transformer to choke	1	10-5429	10-5429	10-5429	E6A652500
77	Bus Bar	Q3,Q4 to output stud	1	10-5435	10-5435	10-5435	E6A653400A
78	PCB 11	PCB11	1	10-6345	10-6345	10-6345	P0A353600
not shown	Chassis			10-5482	10-5482	10-5482	J2B747600
not shown	Acrylic board	under main pcb	1	10-5431	10-5431	10-5431	E6A652800
not shown	R1	on main pcb	1	10-6684	10-6684	10-6684	
not shown	PCB(CE)	PCB101	1	N/A	10-5517	N/A	P0A347500
not shown	Filter	L1	1	10-2290	10-2290	10-2290	47953134100
not shown	Filter (CE)	L106, L107	2	N/A	10-5176	N/A	47953005500
not shown	Filter (CE)	L104	1	N/A	10-5229	N/A	47953005500
not shown	Filter (CE)	L102, L103	2	N/A	10-5230	N/A	47953014500
not shown	Filter (CE)	L104, L105	2	N/A	10-5231	N/A	47953014600
not shown	Female Union (CE)		1	N/A	10-5245	N/A	53550011600
not shown	Holder		4	10-5249	10-5249	10-5249	53692118900
not shown	CN1 Plug 4pos.	PCB1		10-2663	10-2663	10-2663	N/A
not shown	CN2 Plug 6pos.	PCB1		10-2665	10-2665	10-2665	N/A
not shown	CN4 Plug 2pos.	PCB1		10-2662	10-2662	10-2662	N/A
not shown	CN5 Plug 5pos.	PCB1		10-2664	10-2664	10-2664	N/A
not shown	CN6 Plug 7pos.	PCB1		10-2666	10-2666	10-2666	N/A
not shown	CN7 Plug 5pos.	PCB1		10-2664	10-2664	10-2664	N/A
not shown	CN8 Plug 5pos.	PCB1		10-2664	10-2664	10-2664	N/A
not shown	CN9 Plug 5pos.	PCB1		10-2664	10-2664	10-2664	N/A
not shown	CN10 Plug 2pos.	PCB1		10-2662	10-2662	10-2662	N/A
not shown	CN13 Plug 3pos.	PCB1		10-2613	10-2613	10-2613	N/A
not shown	CN14 Plug 4pos.	PCB1		10-2663	10-2663	10-2663	N/A
not shown	CN18 Plug 3pos.	PCB1		10-2613	N/A	N/A	N/A
not shown	CN19 Plug 5pos.	PCB1		N/A	N/A	10-2664	N/A
not shown	CN24 Plug 3pos.	PCB1		10-2613	10-2613	10-2613	N/A
not shown	CN26 Plug 3pos.	PCB1		10-2613	10-2613	10-2613	N/A

ITEM #	DESCRIPTION	LOCATION	QTY.	208/230 MODEL CAT. #	380/415 MODEL CAT. #	230/460 MODEL CAT. #	VENDOR #
not shown	CN3 Plug 7pos.	PCB6		10-2666	10-2666	10-2666	N/A
not shown	CN4 Plug 3pos.	PCB6		10-2613	10-2613	10-2613	N/A
not shown	CN6 Plug 2pos.	PCB6		10-2662	10-2662	10-2662	N/A
not shown	CN1 Plug 3pos.	PCB8		10-2613	10-2613	10-2613	N/A
not shown	CN2 Plug 5pos.	PCB8		10-2663	10-2663	10-2663	N/A
not shown	CN4 Plug 5pos.	PCB8		10-2663	10-2663	10-2663	N/A
not shown	CN5 Plug 2pos.	PCB8		10-2662	10-2662	10-2662	N/A
not shown	Pins for Plugs			10-2671	10-2671	10-2671	N/A
	* Last letter in S/N is "G".						

7.04 Parts Pictures

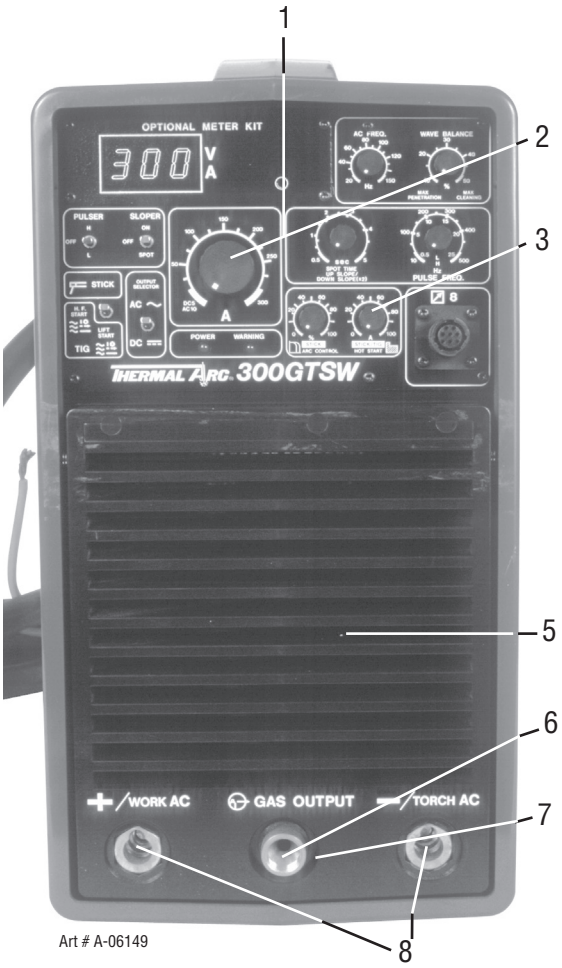


Figure 7-1: Front Panel

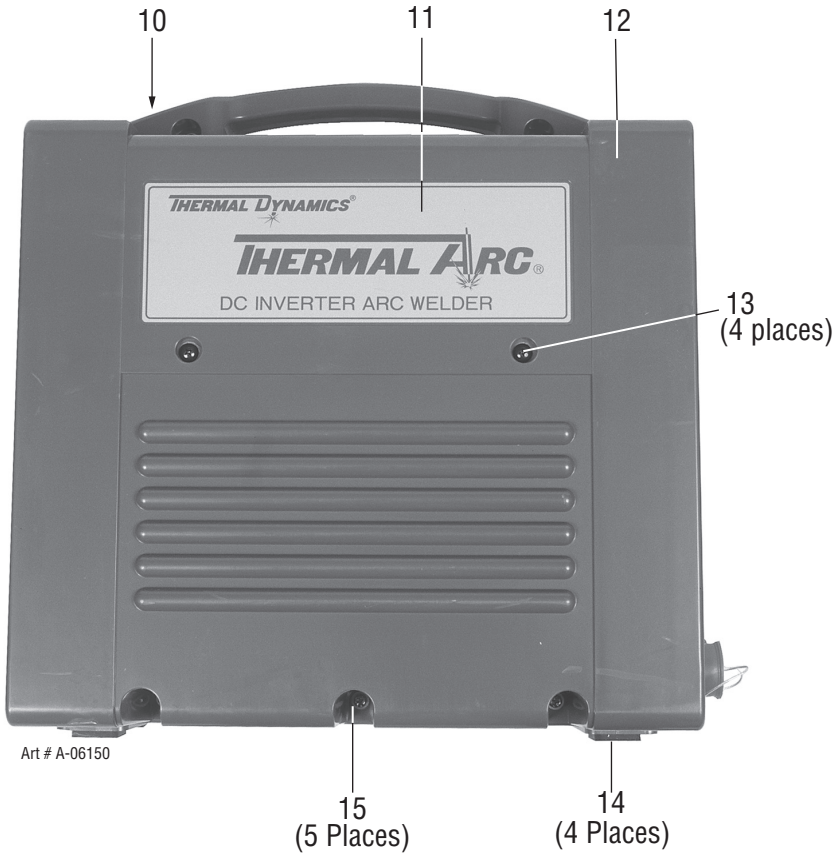


Figure 7-2: Enclosure

Figure 7-3: Rear Panel

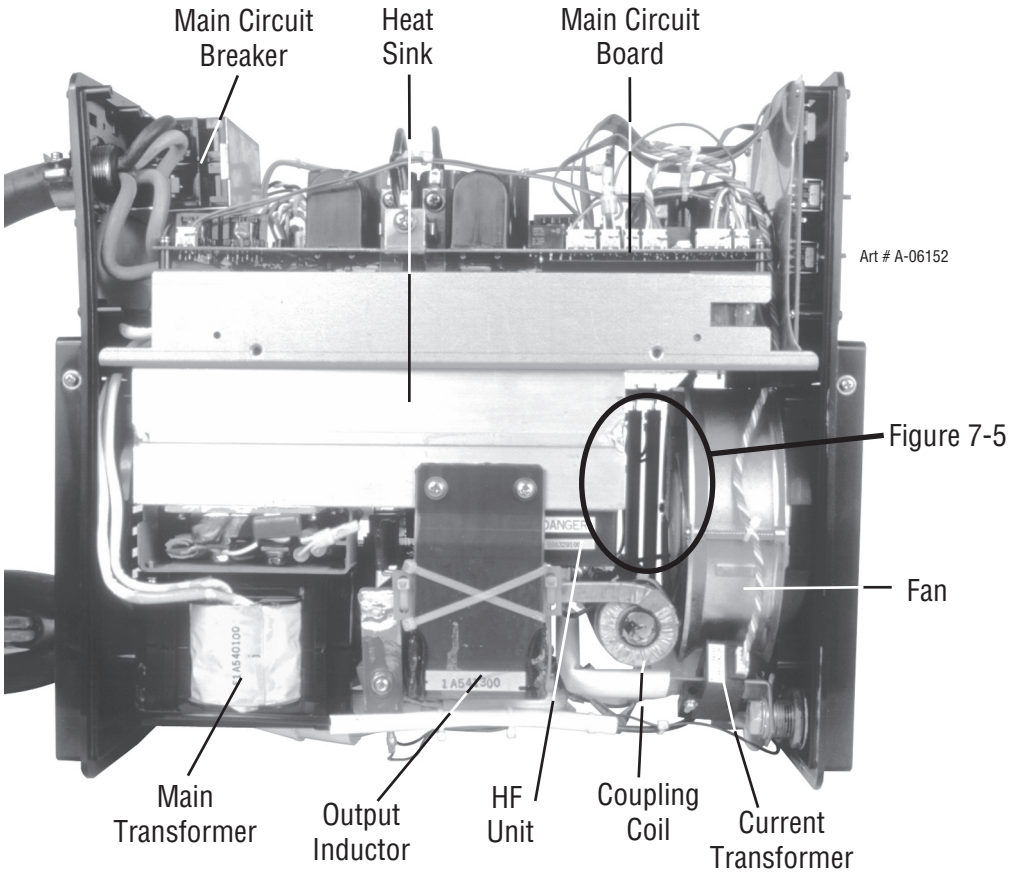


Figure 7-4: Left Side Parts

Figure 7-5: PCB 11

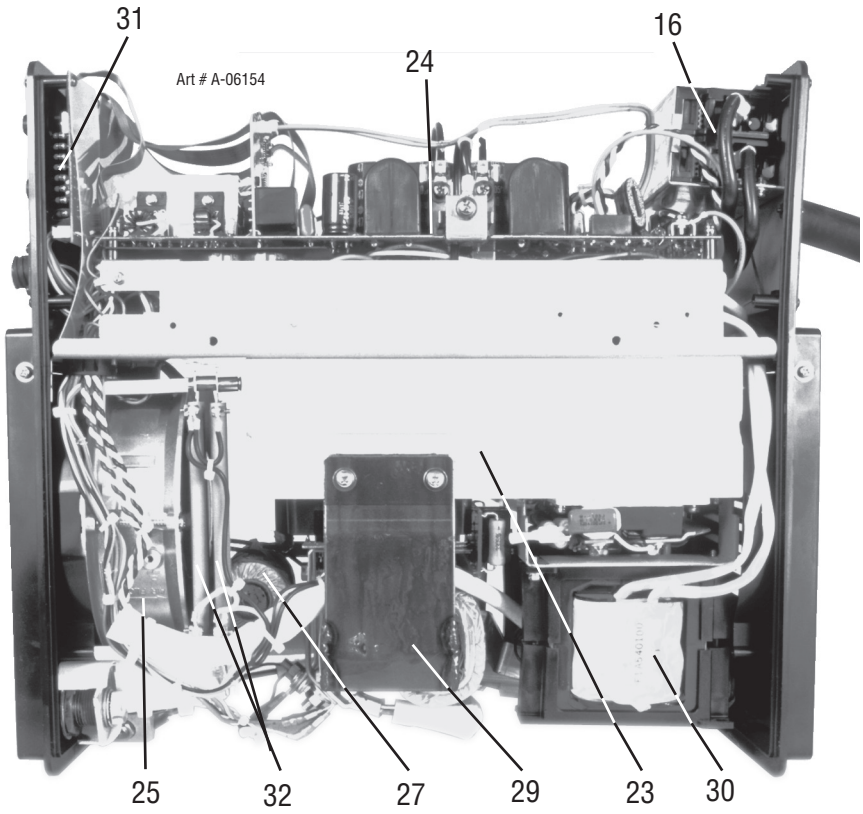


Figure 7-6: Right Side Parts

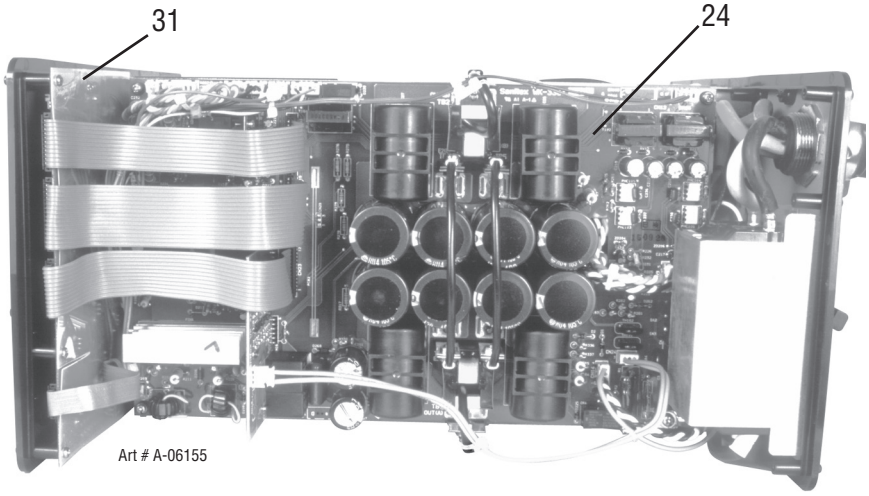


Figure 7-7: Top View Parts

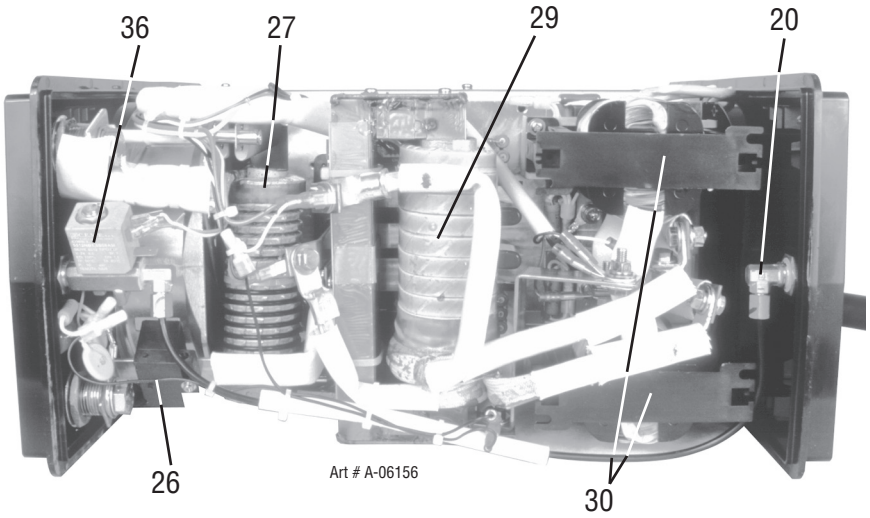


Figure 7-8: Bottom View Parts

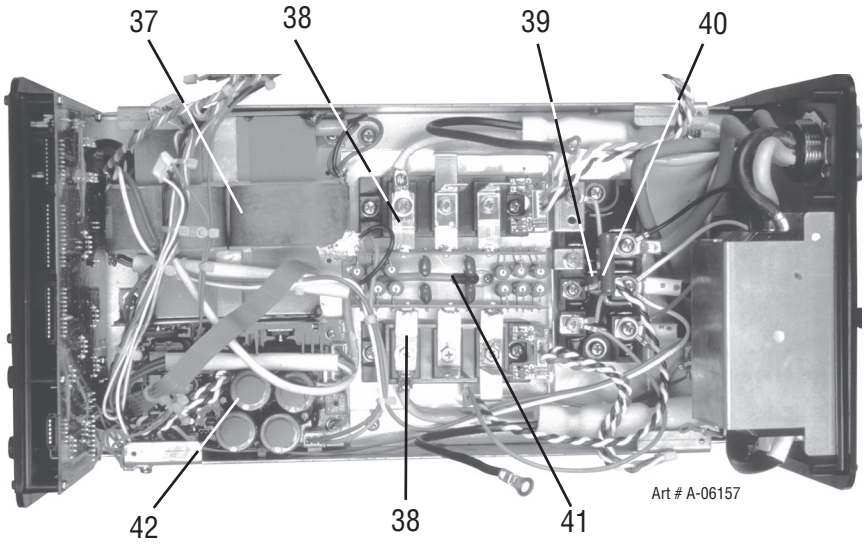


Figure 7-9: Internal Parts

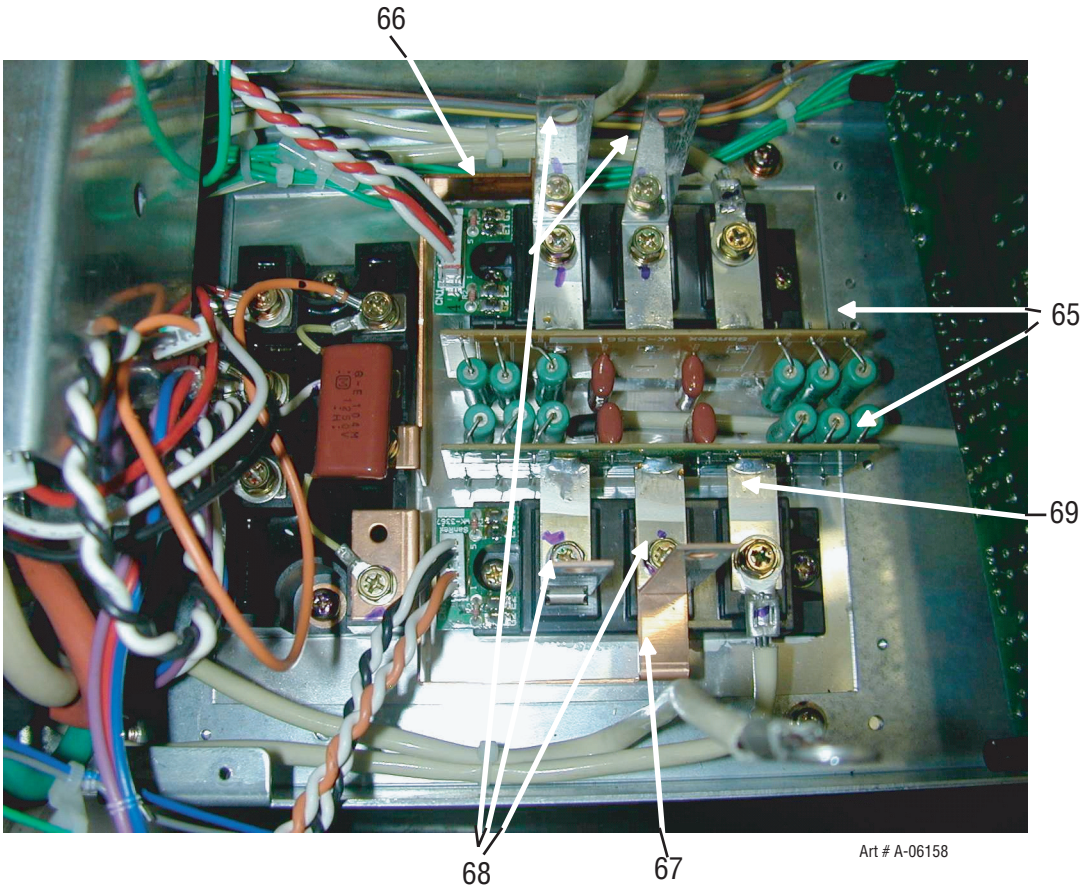


Figure 7-10: Primary IGBT assembly

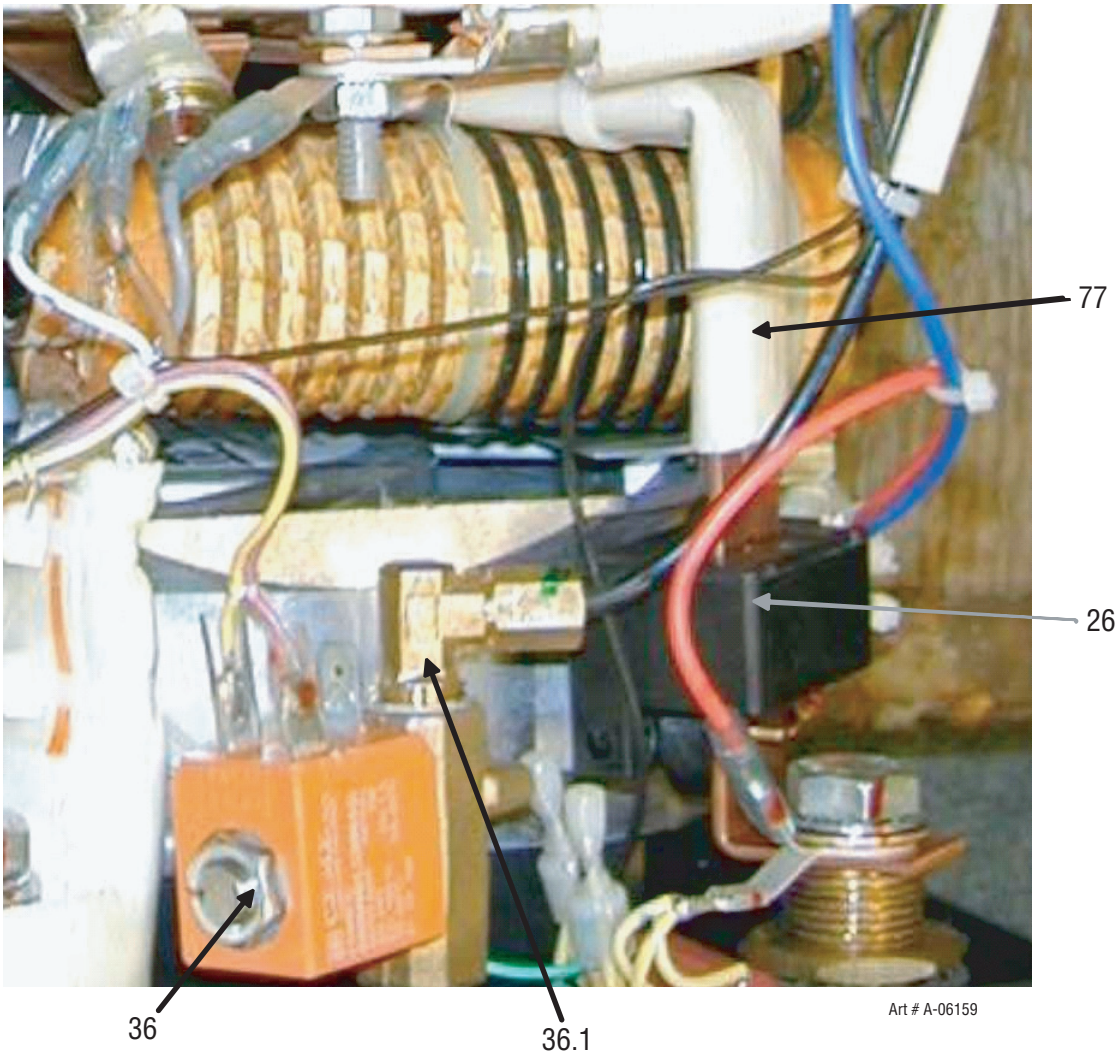
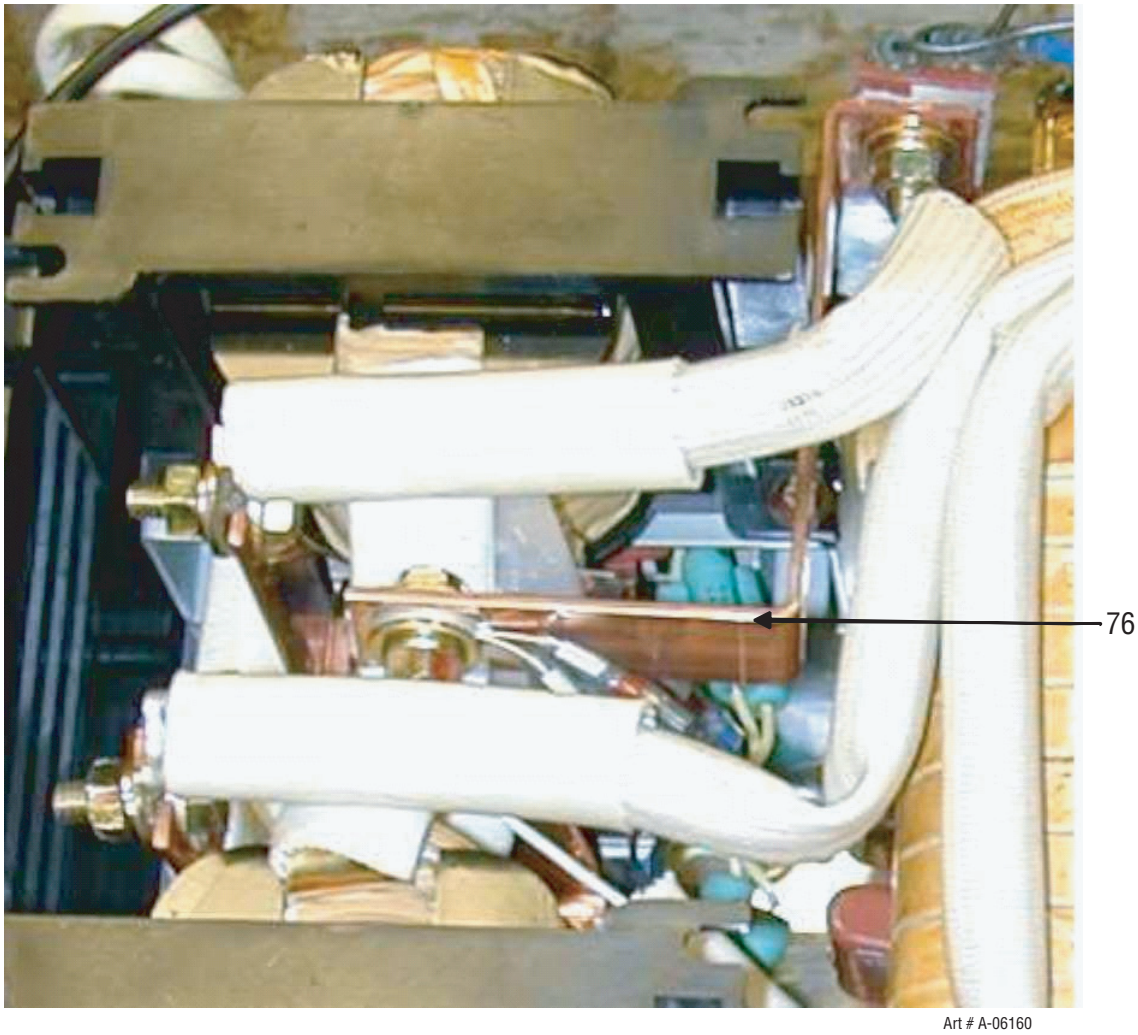


Figure 7-11: Output diode bus bar



Art # A-06160

Figure 7-12: Main Transformer

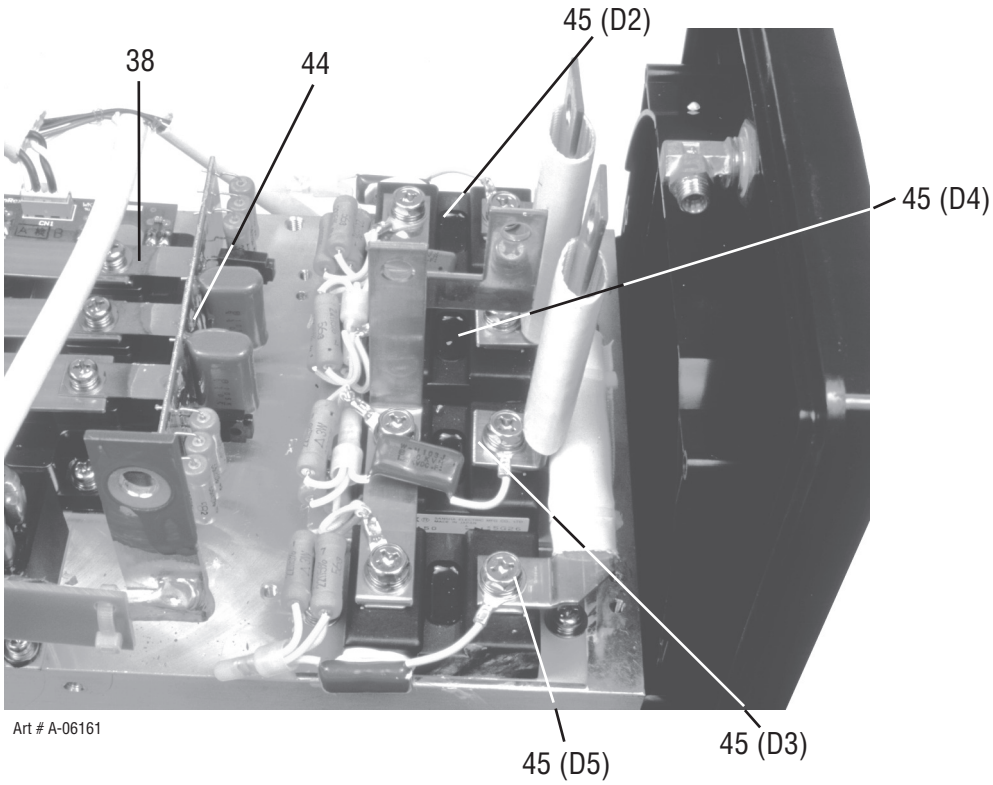


Figure 7-13: Internal Parts continued

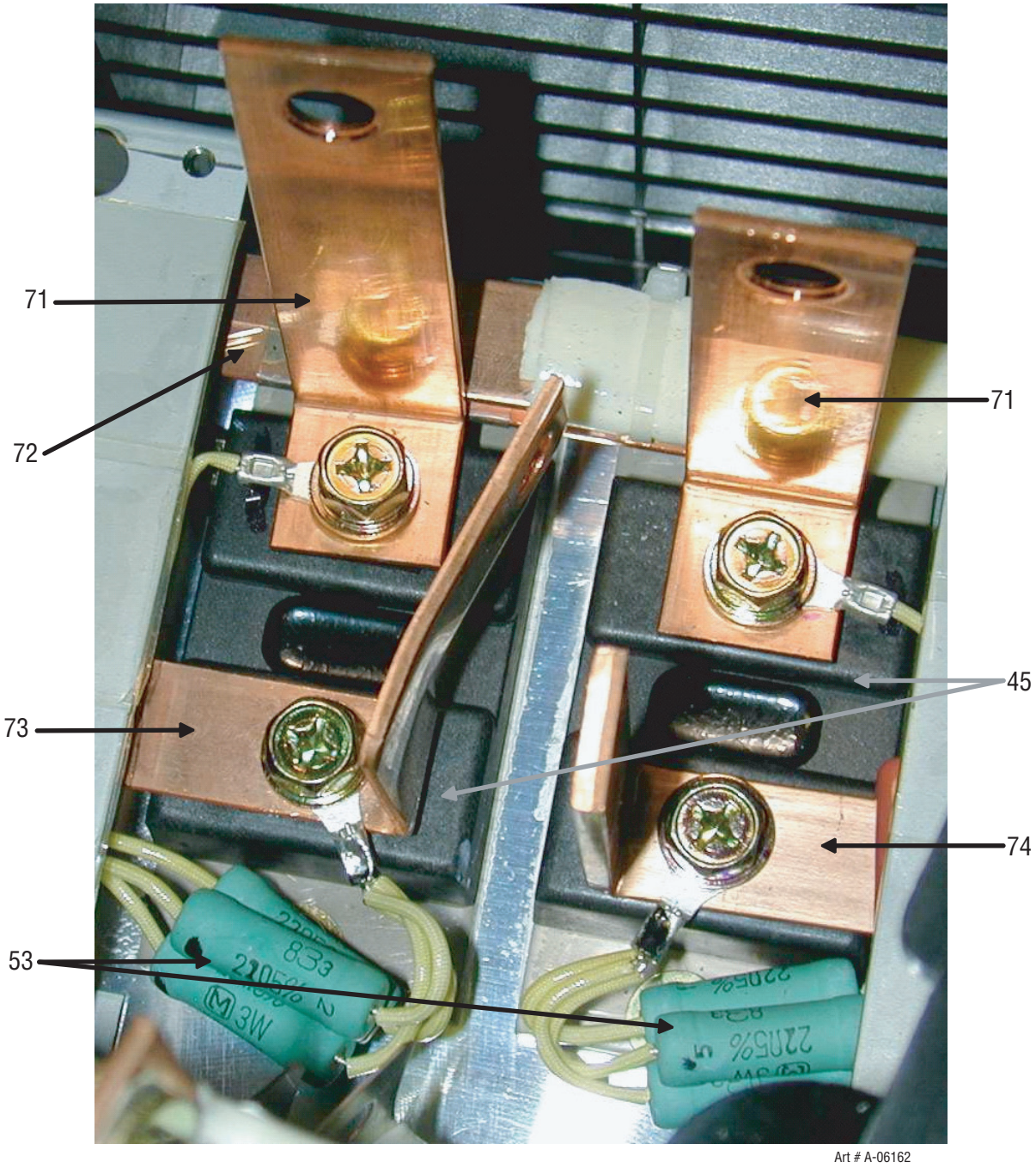


Figure 7-14: Output diode assembly

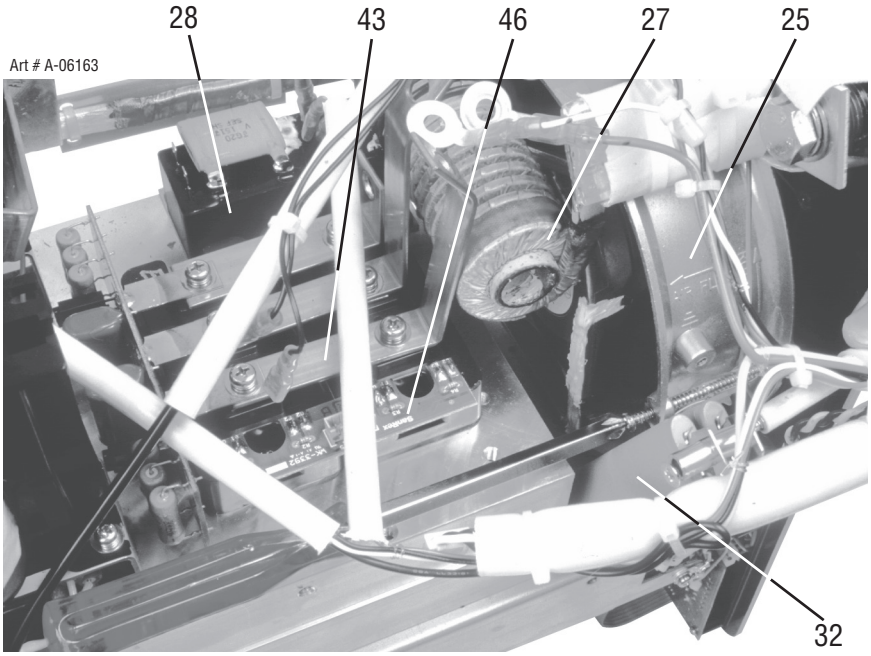


Figure 7-15: Internal Parts continued

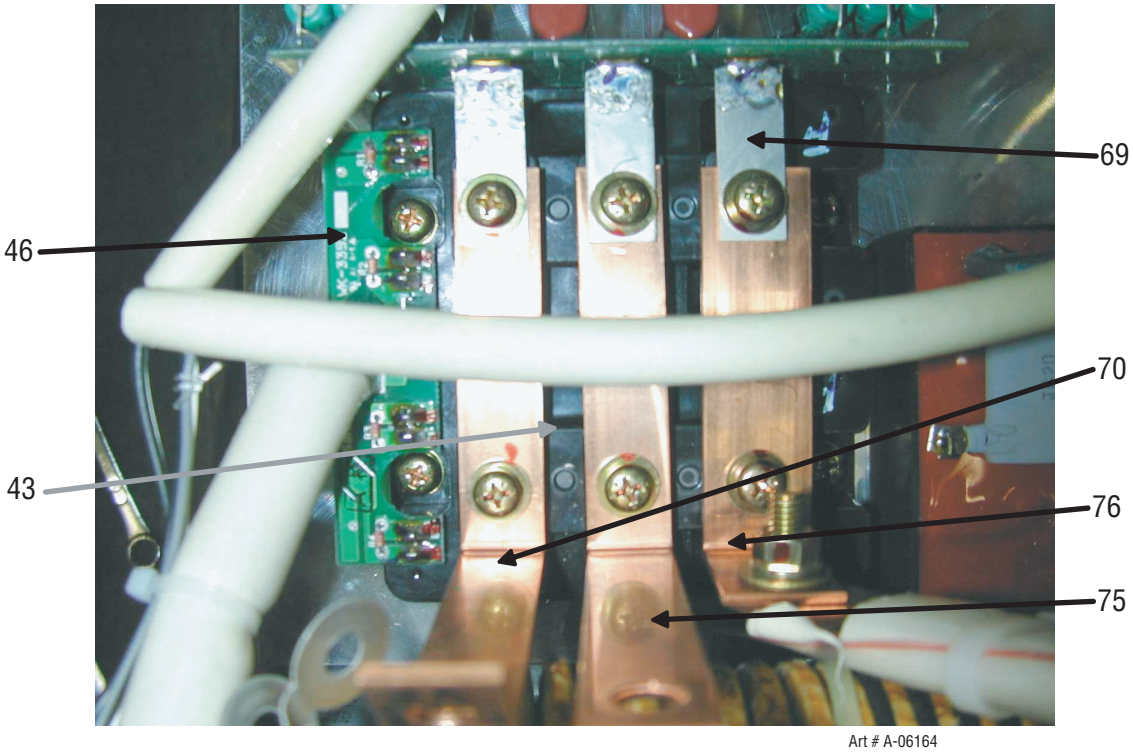


Figure 7-16: Q3, Q4 assembly

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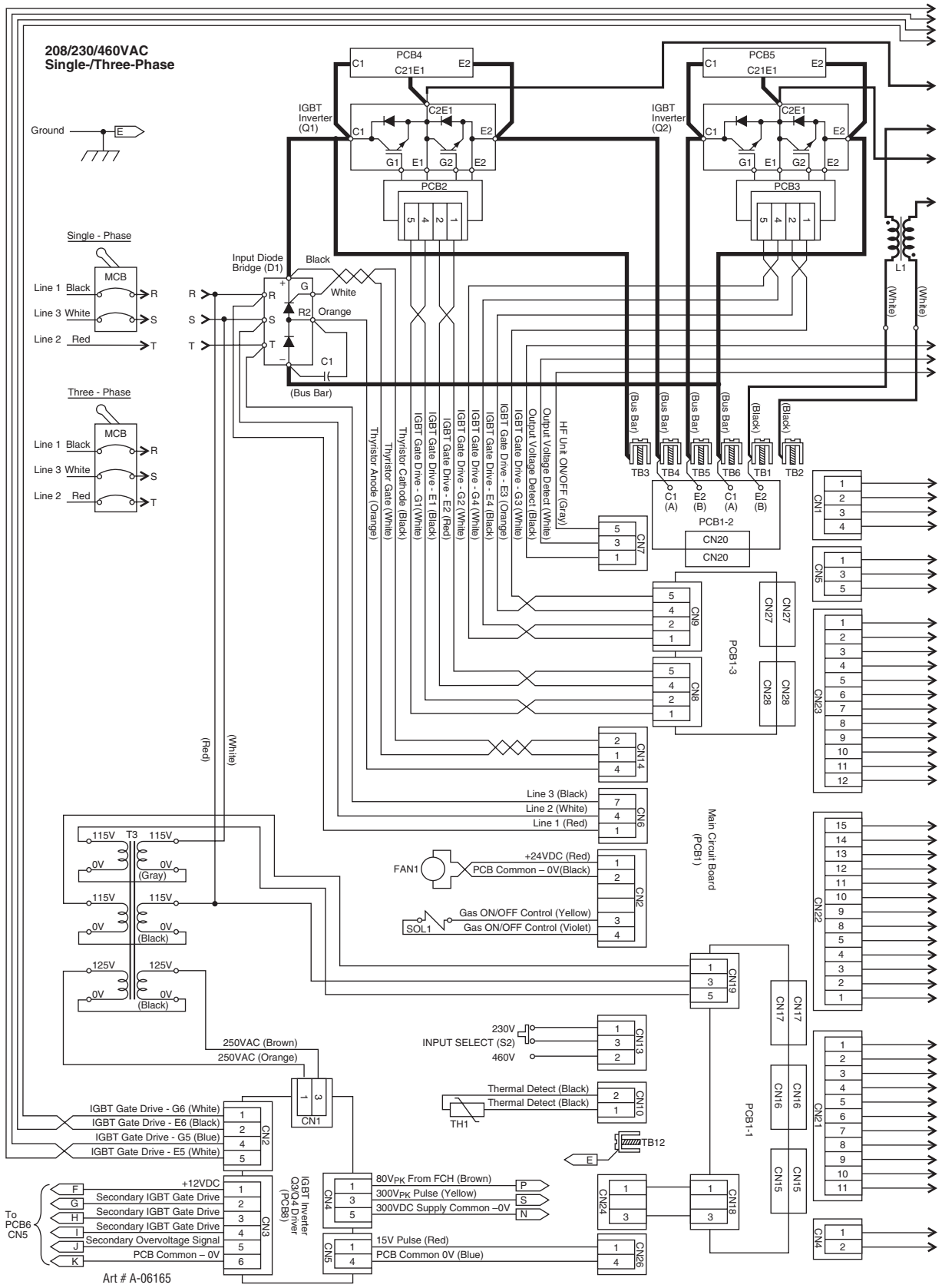
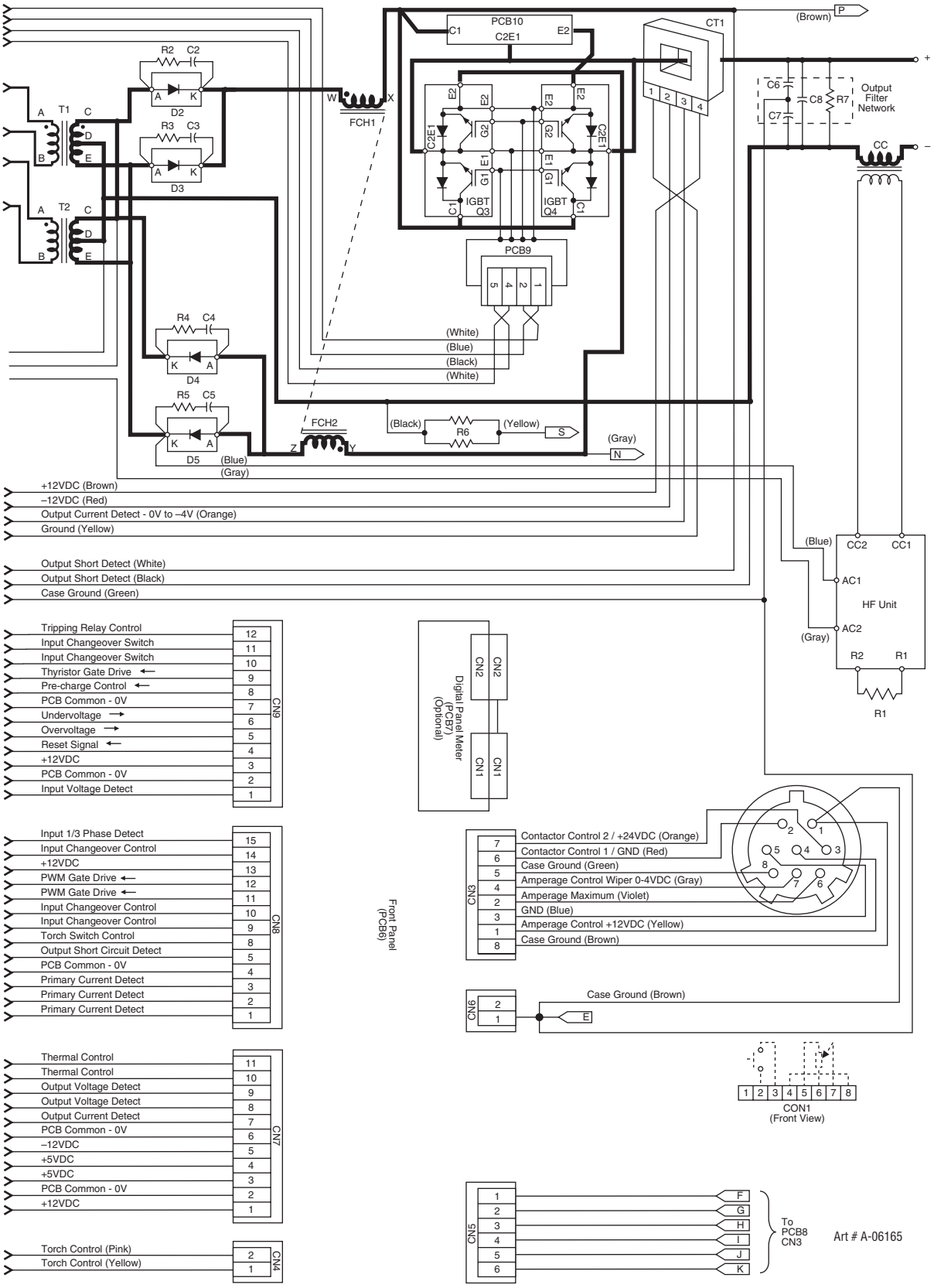
APPENDIX 1: GENERAL INFORMATION

- Note the model and specification number shown on the equipment nameplate.
- Locate these numbers in the model and specification number columns below.
- Use only those diagrams and instructions that are applicable.

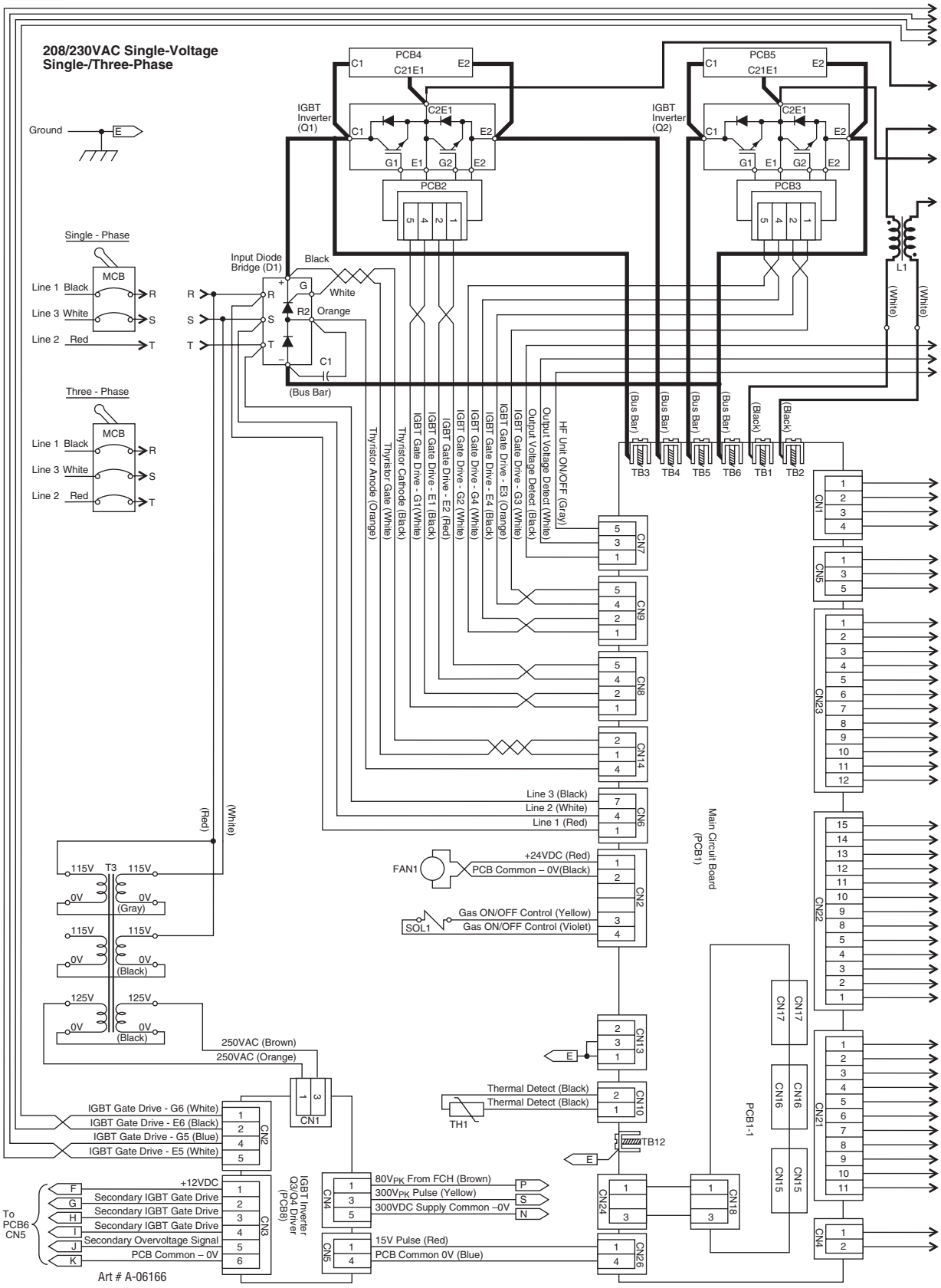
Specification Number	Model	Appendix Location
103024	208/230VAC Single-Voltage, Single-/Three-Phase	2
103025	208/230/460VAC Single-/Three-Phase	3
103038	380/415VAC Single-Voltgae, Three-Phase	4

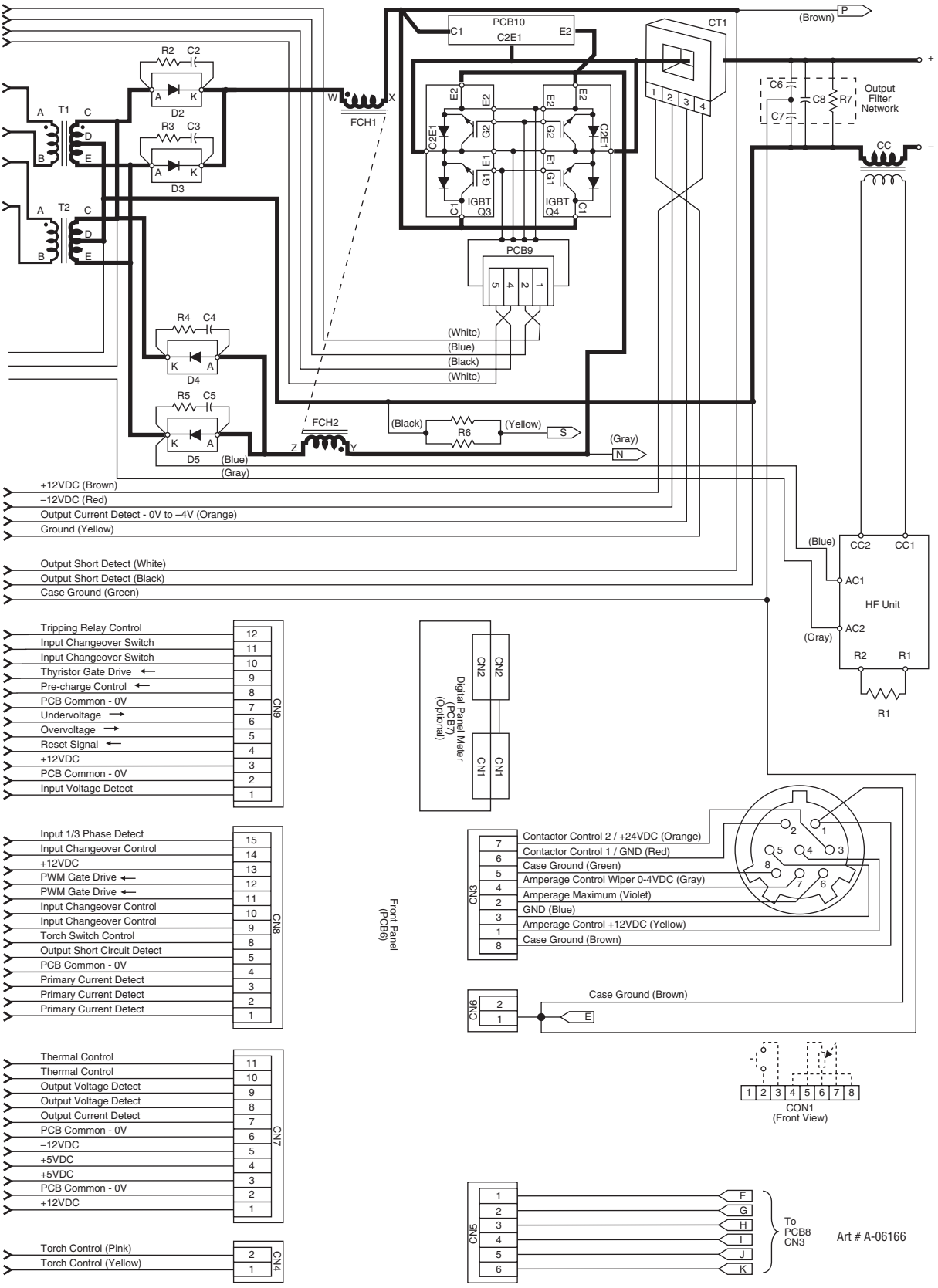
APPENDIX 2: 208/230VAC SINGLE-VOLTAGE SINGLE-/THREE-PHASE



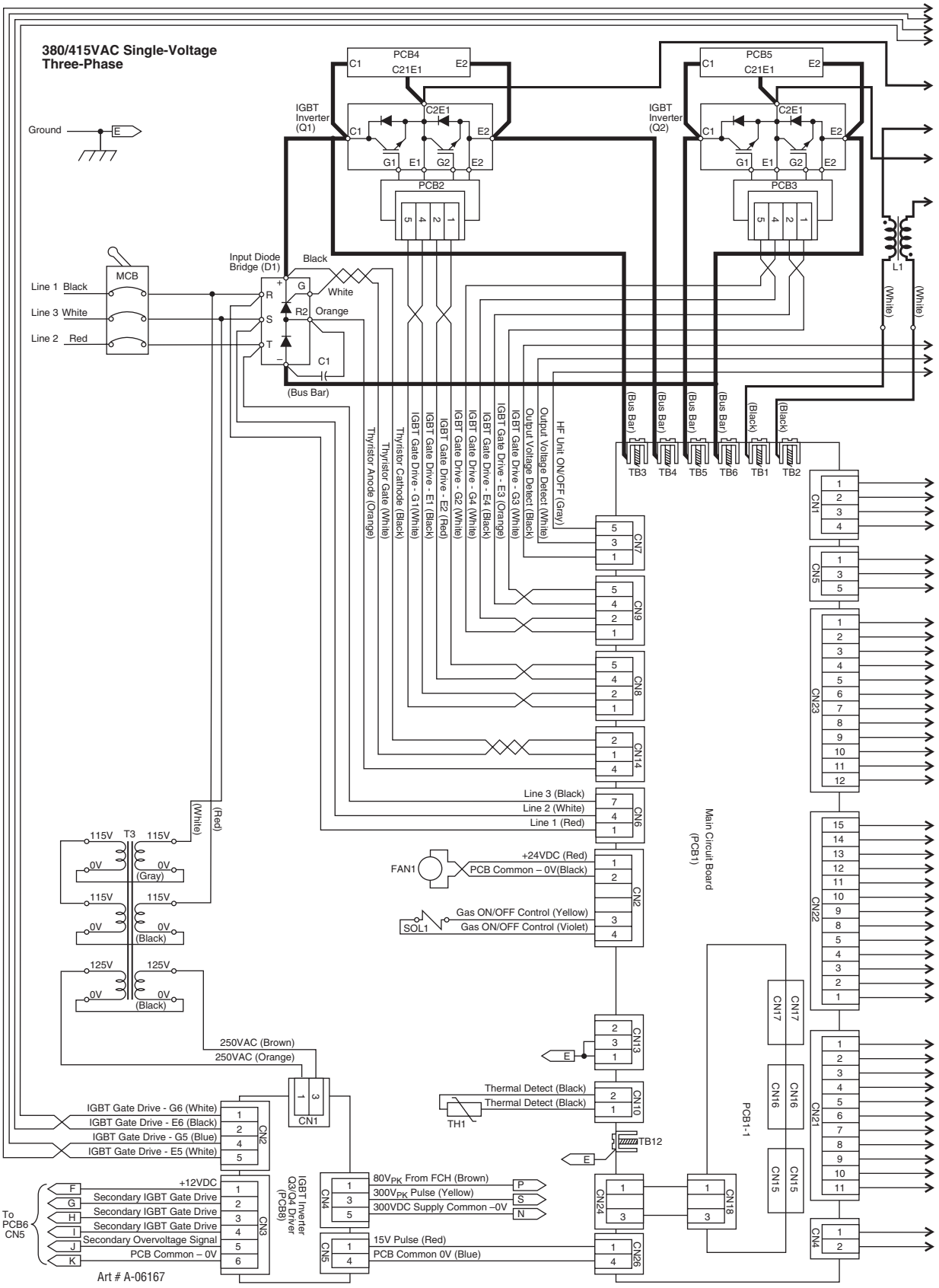

PCB10
C1
C2E1
E2
CT1
(Brown)
P
+
R2 C2
D2
R3 C3
D3
T1
T2
A
B
C
D
E
W
X
FCH1
G2
E1
G1
IGBT Q3
IGBT Q4
C6
C8
R7
C7
Output Filter Network
CC
–
PCB9
5 4 2 1
R4 C4
D4
R5 C5
D5
(White)
(Blue)
(Black)
(White)
FCH2
Z
Y
(Black)
R6
(Yellow)
S
(Gray)
N
(Blue)
(Gray)
+12VDC (Brown)
–12VDC (Red)
Output Current Detect - 0V to –4V (Orange)
Ground (Yellow)
Output Short Detect (White)
Output Short Detect (Black)
Case Ground (Green)
CC2
CC1
AC1
HF Unit
AC2
R2
R1
Tripping Relay Control
Input Changeover Switch
Input Changeover Switch
Thyristor Gate Drive
Pre-charge Control
PCB Common - 0V
Undervoltage
Overvoltage
Reset Signal
+12VDC
PCB Common - 0V
Input Voltage Detect
CN9
Digital Panel Meter (PCB7) (Optional)
CN2
CN1
Input 1/3 Phase Detect
Input Changeover Control
+12VDC
PWM Gate Drive
PWM Gate Drive
Input Changeover Control
Input Changeover Control
Torch Switch Control
Output Short Circuit Detect
PCB Common - 0V
Primary Current Detect
Primary Current Detect
Primary Current Detect
CN8
Front Panel (PCB6)
CN3
Contactor Control 2 / +24VDC (Orange)
Contactor Control 1 / GND (Red)
Case Ground (Green)
Amperage Control Wiper 0-4VDC (Gray)
Amperage Maximum (Violet)
GND (Blue)
Amperage Control +12VDC (Yellow)
Case Ground (Brown)
CN6
Case Ground (Brown)
E
CON1
(Front View)
Thermal Control
Thermal Control
Output Voltage Detect
Output Voltage Detect
Output Current Detect
PCB Common - 0V
–12VDC
+5VDC
+5VDC
PCB Common - 0V
+12VDC
CN7
CN5
To PCB8 CN3
Torch Control (Pink)
Torch Control (Yellow)
CN4
Art # A-06165

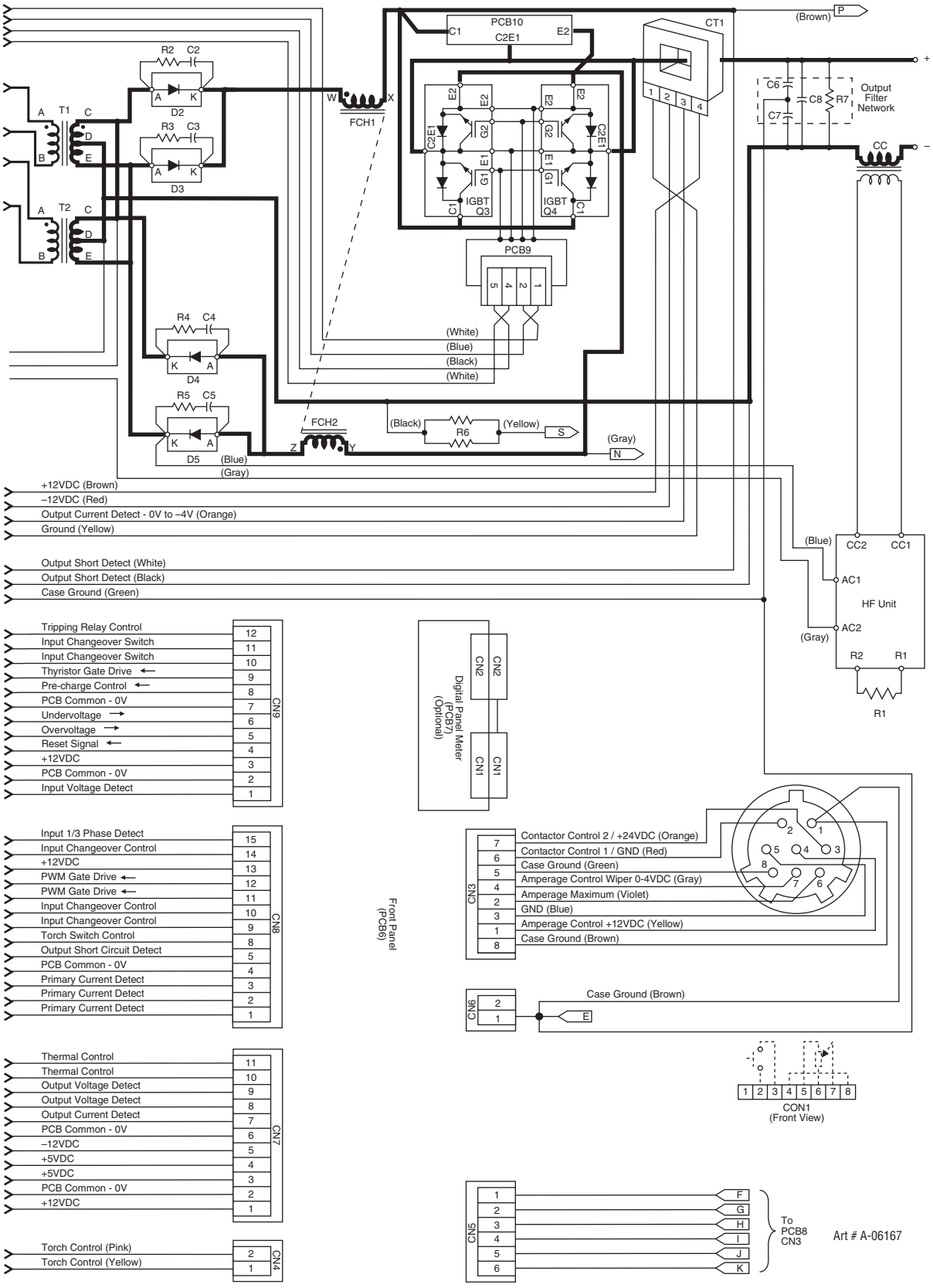
APPENDIX 3: 208/230/460VAC SINGLE-/THREE-PHASE




PCB10
C1
C2E1
E2
CT1
(Brown)
P
R2 C2
D2
R3 C3
D3
T1
T2
FCH1
W
X
C6
C8
R7
C7
Output Filter Network
CC
PCB9
(White)
(Blue)
(Black)
(White)
R4 C4
D4
R5 C5
D5
FCH2
Z
Y
(Black)
R6
(Yellow)
S
(Gray)
N
(Blue)
(Gray)
+12VDC (Brown)
–12VDC (Red)
Output Current Detect - 0V to –4V (Orange)
Ground (Yellow)
Output Short Detect (White)
Output Short Detect (Black)
Case Ground (Green)
(Blue)
CC2
CC1
AC1
HF Unit
AC2
(Gray)
R2
R1
R1
Tripping Relay Control
Input Changeover Switch
Input Changeover Switch
Thyristor Gate Drive
Pre-charge Control
PCB Common - 0V
Undervoltage
Overvoltage
Reset Signal
+12VDC
PCB Common - 0V
Input Voltage Detect
CN9
Digital Panel Meter (PCB7) (Optional)
CN2
CN1
Input 1/3 Phase Detect
Input Changeover Control
+12VDC
PWM Gate Drive
PWM Gate Drive
Input Changeover Control
Input Changeover Control
Torch Switch Control
Output Short Circuit Detect
PCB Common - 0V
Primary Current Detect
Primary Current Detect
Primary Current Detect
CN8
Front Panel (PCB6)
CN3
Contactor Control 2 / +24VDC (Orange)
Contactor Control 1 / GND (Red)
Case Ground (Green)
Amperage Control Wiper 0-4VDC (Gray)
Amperage Maximum (Violet)
GND (Blue)
Amperage Control +12VDC (Yellow)
Case Ground (Brown)
CN6
Case Ground (Brown)
E
Thermal Control
Thermal Control
Output Voltage Detect
Output Voltage Detect
Output Current Detect
PCB Common - 0V
–12VDC
+5VDC
+5VDC
PCB Common - 0V
+12VDC
CN7
CON1
(Front View)
Torch Control (Pink)
Torch Control (Yellow)
CN4
CN5
F
G
H
I
J
K
To PCB8 CN3
Art # A-06166

APPENDIX 4: 380/415VAC SINGLE-VOLTAGE THREE-PHASE




PCB10
C1
C2E1
E2
CT1
(Brown)
P
+
R2 C2
D2
R3 C3
D3
T1
T2
A
B
C
D
E
W
X
FCH1
E2
G2
E1
G1
C2E1
C1
IGBT Q3
IGBT Q4
PCB9
5 4 2 1
C6
C8
R7
C7
Output Filter Network
CC
–
R4 C4
D4
R5 C5
D5
(White)
(Blue)
(Black)
(White)
FCH2
Z
Y
(Black)
R6
(Yellow)
S
(Gray)
N
(Blue)
(Gray)
+12VDC (Brown)
–12VDC (Red)
Output Current Detect - 0V to –4V (Orange)
Ground (Yellow)
Output Short Detect (White)
Output Short Detect (Black)
Case Ground (Green)
(Blue)
CC2
CC1
AC1
HF Unit
AC2
(Gray)
R2
R1
R1
Tripping Relay Control
Input Changeover Switch
Input Changeover Switch
Thyristor Gate Drive
Pre-charge Control
PCB Common - 0V
Undervoltage
Overvoltage
Reset Signal
+12VDC
PCB Common - 0V
Input Voltage Detect
12 11 10 9 8 7 6 5 4 3 2 1
CN9
CN2
CN1
Digital Panel Meter (PCB7) (Optional)
Input 1/3 Phase Detect
Input Changeover Control
+12VDC
PWM Gate Drive
PWM Gate Drive
Input Changeover Control
Input Changeover Control
Torch Switch Control
Output Short Circuit Detect
PCB Common - 0V
Primary Current Detect
Primary Current Detect
Primary Current Detect
15 14 13 12 11 10 9 8 5 4 3 2 1
CN8
Front Panel (PCB6)
Contactor Control 2 / +24VDC (Orange)
Contactor Control 1 / GND (Red)
Case Ground (Green)
Amperage Control Wiper 0-4VDC (Gray)
Amperage Maximum (Violet)
GND (Blue)
Amperage Control +12VDC (Yellow)
Case Ground (Brown)
7 6 5 4 2 3 1 8
CN3
1 2 3 4 5 8 7 6
Case Ground (Brown)
2 1
CN6
E
1 2 3 4 5 6 7 8
CON1
(Front View)
Thermal Control
Thermal Control
Output Voltage Detect
Output Voltage Detect
Output Current Detect
PCB Common - 0V
–12VDC
+5VDC
+5VDC
PCB Common - 0V
+12VDC
11 10 9 8 7 6 5 4 3 2 1
CN7
1 2 3 4 5 6
CN5
F G H I J K
To PCB8 CN3
Art # A-06167
Torch Control (Pink)
Torch Control (Yellow)
2 1
CN4

APPENDIX 5: WIRE CHART MAIN BOARD PCB1

Connector Number	Meter Reading	Comments	Wire color
CN1-1	+12Vdc	Power to CT1	Brown
CN1-2	-12Vdc	Power to CT1	Red
CN1-3	0-4Vdc	1V=50Amps	Orange
CN1-4	GND	common	Yellow
CN2-1	+24Vdc	Fan supply voltage	Red
CN2-2	GND		Black
CN2-3	+24Vdc	Gas Valve supply voltage	Black
CN2-4	0Vdc	When gas valve on	White
CN2-5		not used	
CN2-6		not used	
CN4-1	+24Vdc	torch switch	Yellow
CN4-2	common	torch switch	Pink
CN5-1	+9Vdc	Output short detect	
CN5-3	common	Output short detect	
CN5-5	chassis		
CN6-1		Input line voltage	Red
CN6-4		Input line voltage	White
CN6-7		Input line voltage	Black
CN7-1		Output voltage detect	Black
CN7-3		Output voltage detect	White
CN7-5		HF on signal/ relay N/O	Gray
CN8-1	+5Vdc on / -4Vdc off	G1 Gate drive ref. To E1	Black
CN8-2	common	E1	White
CN8-4	+5Vdc on / -4Vdc off	G2 Gate drive ref. To E2	White
CN8-5	common	E2	Red
CN9-1	+5Vdc on / -4Vdc off	G3 Gate drive ref. To E3	Black
CN9-2	common	E3	White
CN9-4	+5Vdc on / -4Vdc off	G4 Gate drive ref. To E4	White
CN9-5	common	E4	Orange
CN10-1	+5Vdc	Thermal sensor power supply	Black
CN10-2	variable	Thermal sensor input	Black
CN13-1	0V = 230V input / 5V = 460V input	Easylink switch	Blue
CN13-2	5V = 230V input 0V = 460V input	Easylink switch	Gray
CN13-3	common	common	Green
CN14-1		Thyristor gate	Black
CN14-2		Thyristor cathode	White
CN14-3		not used	
CN14-4		Thyristor anode	Orange
CN18-1		Thyristor gate drive relay contact	Orange
CN18-2		not used	
CN18-3		Thyristor gate drive relay contact	Gray

Connector Number	Meter Reading	Comments	Wire color
CN21-1	+12Vdc	Power supply	Ribbon
CN21-2	common		Ribbon
CN21-3	+5Vdc	Power supply	Ribbon
CN21-4	+5Vdc	Power supply	Ribbon
CN21-5	-12Vdc	Power supply	Ribbon
CN21-6	common		Ribbon
CN21-7	1V=50A	Output current detect	Ribbon
CN21-8	squarewave	Output voltage detect	Ribbon
CN21-9	squarewave	Output voltage detect	Ribbon
CN21-10	+5Vdc	power supply for thermal	Ribbon
CN21-11	variable	thermal input	Ribbon
CN22-1	squarewave	Primary current detect	Ribbon
CN22-2	squarewave	Primary current detect center tap	Ribbon
CN22-3	squarewave	Primary current detect	Ribbon
CN22-4	common		Ribbon
CN22-5	+5V on / 0V off	Output short detect	Ribbon
CN22-6		HF on/off	Ribbon
CN22-7		Gas valve on/off	Ribbon
CN22-8	+12 on / 0V off	torch switch	Ribbon
CN22-9	0V = 230V input 5V = 460V input	Easylink switch	Ribbon
CN22-10	5V = 230V input 0V = 460V input	Easylink switch	Ribbon
CN22-11	+12 off / +11 on	PWM Gate drive(squarewave)	Ribbon
CN22-12	+12 off / +11 on	PWM Gate drive(squarewave)	Ribbon
CN22-13	+12Vdc		Ribbon
CN22-14	12V=230V input 0V=460V input	Input changeover circuit	Ribbon
CN22-15		Single/Three phase detect	Ribbon
CN23-1	0V = 230V input 5V = 460V input	Input voltage detect	Ribbon
CN23-2	common		Ribbon
CN23-3	+12Vdc	Power supply	Ribbon
CN23-4		Reset signal	Ribbon
CN23-5	0V= OVR detected / 5V no OVR	Overvoltage detect	Ribbon
CN23-6	0V= UVR detected / 5V no UVR	Undervoltage detect	Ribbon
CN23-7	common		Ribbon
CN23-8		Pre-charge control	Ribbon
CN23-9		Thyristor gate drive	Ribbon
CN23-10	0V = 230V input 5V = 460V input	Easylink switch	Ribbon
CN23-11	5V = 230V input 0V = 460V input	Easylink switch	Ribbon
CN23-12		Tripping relay control	Ribbon
CN24-1		Thyristor gate drive relay contact	Gray
CN24-2		not used	
CN24-3		Thyristor gate drive relay contact	Orange

Connector Number	Meter Reading	Comments	Wire color
CN26-1	15V squarewave	Super-impose gate drive	
CN26-2	common		
CN26-3		not used	
CN30-1	+12Vdc	PCB11	
CN30-2		not used	
CN30-3		Tripping relay control	

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APPENDIX 6: WIRE CHART FRONT PANEL PCB6

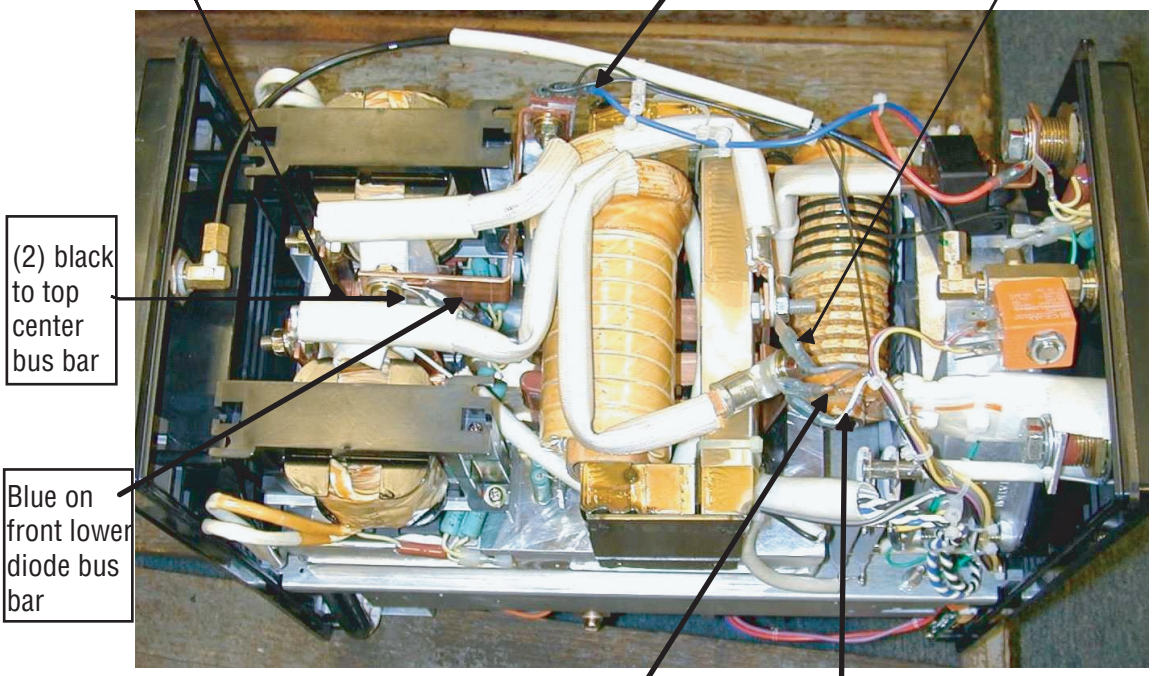
Connector Number	Meter Reading	Comments	Wire color
CN1		Meter circiut	
CN2		Meter circiut	
CN3-1	+12 Vdc	Pin 4	Yellow
CN3-2	common	Remote Reference Common Pin 6	Violet
CN3-3	0V to 4V "F" or 0V to 10V"G"	Remote Ref. Out Pin 5	Blue
CN3-4	0V to 4V "F" or 0V to 10V"G"	Remote reference in from remote control Pin 7	Gray
CN3-5	+12Vdc	When remote plugged in Pin 8	Green
CN3-6		Torch switch Pin 2	Red
CN3-7		Torch switch Pin 3	Orange
CN4-1	+24Vdc	torch switch	Yellow
CN4-2	common	torch switch	Pink
CN5-1	+12Vdc	Power supply	Ribbon
CN5-2	squarewave	Straight polarity gate drive	Ribbon
CN5-3	squarewave	Reverse polarity gate drive	Ribbon
CN5-4	squarewave	Super-impose gate drive	Ribbon
CN5-5		Secondary overvoltage signal	Ribbon
CN5-6	common		Ribbon
CN6-1	chassis	Pin1	Brown
CN6-2	chassis	Pin1	Brown
CN7-1	+12Vdc	Power supply	Ribbon
CN7-2	common		Ribbon
CN7-3	+5Vdc	Power supply	Ribbon
CN7-4	+5Vdc	Power supply	Ribbon
CN7-5	-12Vdc	Power supply	Ribbon
CN7-6	common		Ribbon
CN7-7	1V=50A	Output current detect	Ribbon
CN7-8	squarewave	Output voltage detect	Ribbon
CN7-9	squarewave	Output voltage detect	Ribbon
CN7-10	+5Vdc	power supply for thermal	Ribbon
CN7-11	variable	thermal input	Ribbon
CN8-1	squarewave	Primary current detect	Ribbon
CN8-2	squarewave	Primary current detect center tap	Ribbon
CN8-3	squarewave	Primary current detect	Ribbon
CN8-4	common		Ribbon
CN8-5	+5V on / 0V off	Output short detect	Ribbon
CN8-6	0/12	HF on/off	Ribbon
CN8-7	0/12	Gas valve on/off	Ribbon
CN8-8	+12 on / 0V off	torch switch	Ribbon
CN8-9	0V = 230V input 12V = 460V input	Easylink switch	Ribbon
CN8-10	12V = 230V input 0V = 460V input	Easylink switch	Ribbon

Connector Number	Meter Reading	Comments	Wire color
CN8-11	+12 off / +11 on	PWM Gate drive(squarewave)	Ribbon
CN8-12	+12 off / +11 on	PWM Gate drive(squarewave)	Ribbon
CN8-13	+12Vdc		Ribbon
CN8-14	0V = 230V input 12V = 460V input	Input changeover circuit	Ribbon
CN8-15	not used	Single/Three phase detect	Ribbon
CN9-1	0V = 230V input 5V = 460V input	Input voltage detect	Ribbon
CN9-2	common		Ribbon
CN9-3	+12Vdc	Power supply	Ribbon
CN9-4		Reset signal	Ribbon
CN9-5	0V= OVR detected / 5V no OVR	Overvoltage detect	Ribbon
CN9-6	0V= UVR detected / 5V no UVR	Undervoltage detect	Ribbon
CN9-7	common		Ribbon
CN9-8		Pre-charge control	Ribbon
CN9-9		Thyristor gate drive	Ribbon
CN9-10	0V = 230V input 5V = 460V input	Easylink switch	Ribbon
CN9-11	5V = 230V input 0V = 460V input	Easylink switch	Ribbon
CN9-12		Tripping relay control	Ribbon

APPENDIX 7: WIRE CHART AC IGBT GATE DRIVE PCB8

Connector Number	Meter Reading	Comments	Wire color
CN1-1	250Vac		Brown
CN1-2		not used	
CN1-3	250Vac		Orange
CN2-1	squarewave	Q3 G5 gate drive	White
CN2-2	squarewave	Q3 E5 gate drive	Black
CN2-3		not used	
CN2-4	squarewave	Q3 G6 gate drive	Blue
CN2-5	squarewave	Q3 E6 gate drive	White
CN3-1	+12Vdc	Power supply	Ribbon
CN3-2	squarewave	Straight polarity gate drive	Ribbon
CN3-3	squarewave	Reverse polarity gate drive	Ribbon
CN3-4	squarewave	Super-impose gate drive	Ribbon
CN3-5		Secondary overvoltage signal	Ribbon
CN3-6	common		Ribbon
CN4-1	80Vpk	Weld volts from FCH	Brown
CN4-2		not used	
CN4-3	300Vpk pulse	Super-impose output voltage	Yellow
CN4-4		not used	
CN4-5	300Vpk common	Super-impose output voltage	Gray
CN5-1	squarewave	15V pulse to fire super-impose voltage	Red
CN5-2	common		Blue

APPENDIX 8: BOTTOM WIRING PLACEMENT DIAGRAM


White on lower diode bus bar rear of unit
Black, Black, and Blue Wires
Gray to bus bar in center
(2) black to top center bus bar
Blue on front lower diode bus bar
Brown to outside FCH connection
White to outside FCH connection

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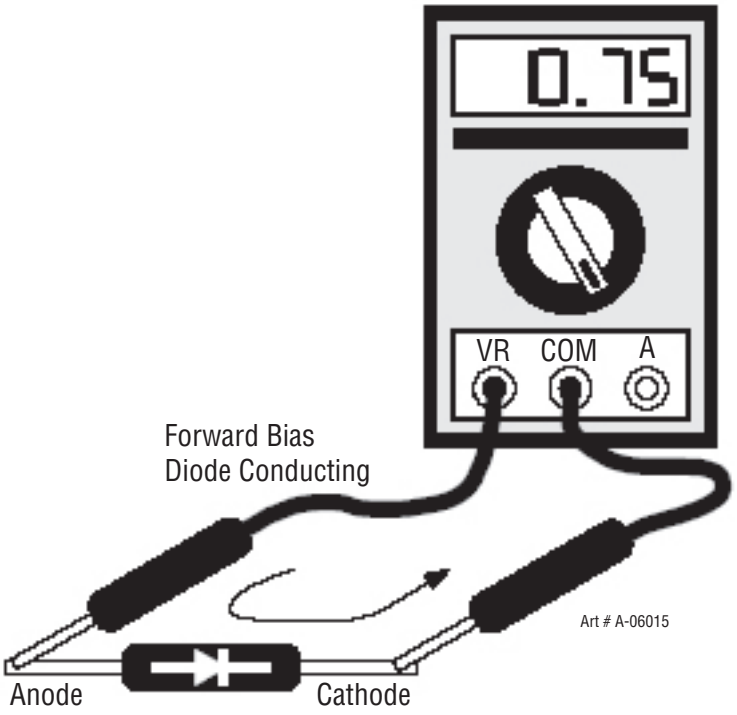
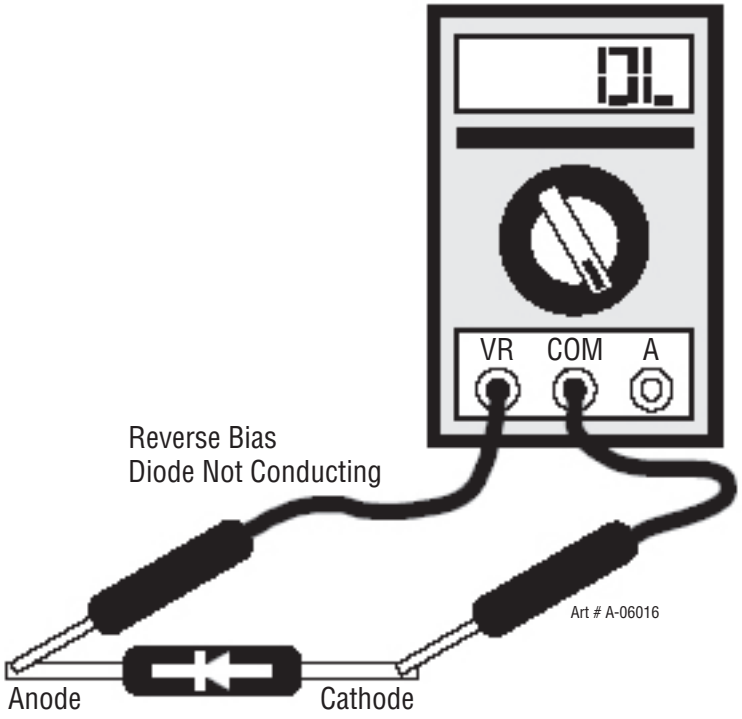
APPENDIX 9: DIODE TESTING BASICS

Testing of diode modules requires a digital Volt/Ohmmeter that has a diode test scale.

1. Locate the diode module to be tested.
2. Remove cables from mounting studs on diodes to isolate them within the module.
3. Set the digital volt/ohm meter to the diode test scale.
4. Using figure A-6 and A-7, check each diode in the module. Each diode must be checked in both the forward bias (positive to negative) and reverse bias (negative to positive) direction.
5. To check the diode in the forward bias direction, connect the volt/ ohm meter positive lead to the anode (positive, +) of the diode and the negative lead to the cathode (negative, -) of the diode (refer to figure A-6). A properly functioning diode will conduct in the forward bias direction, and will indicate between 0.3 and 0.9 volts.
6. To check the diode in the reverse bias direction, reverse the meter leads (refer to figure A-6). A properly functioning diode will block current flow in the reverse bias direction, and depending on the meter function, will indicate an open or “OL”.
7. If any diode in the module tests as faulty, replace the diode module.
8. Reconnect all cables to the proper terminals.



Forward Bias Diode Test



Reverse Bias Diode Test

APPENDIX 10: METER CALIBRATION PROCEDURE

The digital meter (Cat. # 10-4000) calibration is controlled by a microprocessor inside the machine and adjusts for variations in calibration. If you suspect a problem with the meter due to damage, etc. you can check the calibration of the meter by the following test procedure below:

Make sure the remote voltage and amperage meters are calibrated and can measure frequencies above 42K Hz.

AMPERAGE MEASUREMENT (Stick mode)

Under load the preset voltage setting is arbitrary and is not adjustable. Under load the Panel meter voltage reading versus the actual voltage reading maybe ±5% dependent on the arc length and the combines length of the negative and positive welding leads. Preset voltage is used for MIG operation and is valid on the LM300 and 400GMS.

AMPERAGE TEST

1. Set the controls for STICK mode, ARC CONTROL minimum, HOT START minimum.
2. Connect the negative and positive output terminals to a load capable of the maximum current of the power supply.
3. Turn on the power supply.
4. To verify perform the following tests.

   a) Set the preset to minimum amps. Load voltage under this test should be approximately 1 to 2 volt.

   b) Set the preset to 150 amps. Load voltage under this test should be approximately 20 to 25 volts.

   c) Set the preset to 300 amps. Load voltage under this test should be approximately 25 to 30 volts.

Panel Meter amperage versus measured amperage reading maybe ± 5% depending on the load and length of cables.

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